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Vol. XXIII CHICAGO, MARCH 9, 1932 No. 12

Work Progresses on Huge Gravel Plant

3,600 TONS PER HOUR OUTPUT

What is said to be the world's largest sand-and-gravel plant, to have an annual capacity of 5,000,000 tons, is being built by the Construction Materials Corp. of Chicago in Ferrysburg, Mich. The plant will be provided with equipment to unload scows; convey, crush, wash, classify, and store material; and deliver it in any combination of sizes to railroad cars, boats, or trucks. Vessels will be unloaded at the rate of 3,600 tons per hour.

The entire plant will be able to be under the control of a single operator by means of a special drum which will set-up any one of a number of different operations. Before being shipped, all disconnect switches, control switches, relays, and other control for each motor, or for each group of motors in one location, will be grouped together on pipe frame supports with interconnecting wiring. Approximately 4,000 hp. in motors is being provided. All motors, control switchboard, V-belt drives, lighting equipment, and No-fuse panelboards are being supplied by the Westinghouse Electric & Manufacturing Co.

The plant was designed by Charles M. Rudow, consulting engineer of Chicago.

Lone Star Texas Plans Higher 'Incor' Output

Expansion and improvements are being carried on at the Dallas, Tex., plant of Lone Star Cement Co. Texas to provide increased production for "Incor," the company's brand of quick-hardening cement.

It is expected to place the output of this product on a 24-hr. basis and it is planned to turn out 300,000 bbl. at the plant this year.

Court Awards Silicosis Victim $17,000 Damages

Oscar Madison of Streator, Ill., now a patient in a sanitarium suffering from silicosis, was awarded $17,000 damages against his former employer, the Wedron Silica Sand Co. of Wedron, Ill., by a circuit-court jury at Ottawa, Ill., on February 16. The plaintiff had sued for $25,000 and the case had been on trial for more than two weeks. Counsel for the defense moved that the verdict be set aside and filed a motion for a new trial. Both were denied by Judge Eldredge. An appeal to the Illinois supreme court is pending.

A few month ago, Charles Clouse, another employee of the Wedron company, obtained a $10,000 judgment in a similar suit which was tried at Streator, Ill. Only recently, Judge Hayes denied the company a new trial. This case, too, is to be appealed to the supreme court, it is reported.

Millions Sell Plants to American Aggregates

The American Aggregates Corp. of Greenville, O., has acquired the plants and assets of the Million Sand & Gravel Co. of Lake Cicotte, Ind. According to Frank Million, sale of the company was made on account of the illness of his father, Floyd Million. The former will continue in the sand-and-gravel business as an executive of the American Aggregates Corp., and according to present plans will have charge of the newly-acquired operations with which he is familiar.

The company operates two plants at Lake Cicotte.

Plans Cement Shipments Over New Illinois Canal

With the completion of the Lakes-to-Gulf waterway in prospect this year, the Marquette Cement Manufacturing Co. is already making plans to ship cement by barge to Chicago, according to reports. The company expects to send up to a million barrels annually over the new route, it is said.

Upper House Passes Highway Bill

The emergency highway bill, providing for the making immediately available of the sum of $120,000,000 for Federal-aid highways and $12,500,000 for roads through national forests, was passed by the House of Representatives during the last week in February. That it will pass the Senate and be signed by President Hoover, becoming a law, is said to be a foregone conclusion.

Asks Cement Awards Be Split Five Ways

BIDDERS URGED TO FIX PRICE

The commissioners of Cook County, Illinois, in a recent session at Chicago invited representatives of five cement companies, bidders on a $1,000,000 contract for county road-building material, to appear before the board and consider splitting the sale among them. The action was taken during a stormy session of the roads and bridges committee. It was suggested by Commissioner Charles Weber, who said it would be good practice, in view of present business conditions and the fact that the Marquette Company had just obtained a 2,500,000-bbl. contract from the state of Illinois, to divide the contract among all the companies, provided they would agree to the purchase price per barrel of the low bidder.

Under Illinois statutes the commissioners must award all contracts to the lowest in a group of competitive bidders, and Commissioner Weber's suggestion met with opposition. County Attorney Hayden Bell informed the commissioners that the proposed action would be illegal. The board might, however, award only part of the contract and then readvertise for bids, he said.

The Marquette Cement Manufacturing Co. figure of $1.45 per bbl. was low by 6 cents. The other bidders are the Universal Atlas Cement Co., the Lehigh Portland Cement Co., the Medusa Portland Cement Co., and the Alpha Portland Cement Co. These four all submitted the same bid of $1.51 per bbl., according to reports.

Snowbound Gold Mine Receives Lime by Plane

Heavy snows in the mountains of eastern Oregon necessitated the delivery of six bags of lime by airplane recently. A gold-mining concern, whose operations are located high in the ranges, had immediate need for the lime and a telegram to a building-materials dealer at Eugene, Ore., soon arranged for its delivery. The six sacks were made up into two bundles and dropped from the plane while flying at a low altitude. A 25-ft. layer of snow cushioned its fall.

Curtailed Road Work Cuts Cement Output

LEHIGH VALLEY PLANTS HIT

The abrupt curtailment of concrete-road construction in Pennsylvania in 1931 was partly responsible for a decrease of nearly 2,000,000 man-hours of labor in the cement mills of the Lehigh Valley district, according to a survey just completed by the Allentown, Pa., Chamber of Commerce. Statistics were supplied by eight manufacturers operating twelve plants.

"The facts, briefly, are these," reads a statement issued by the Allentown organization:

"In 1929, 17,131,237 bbl. of cement were produced in this area which is America's greatest cement-manufacturing district. In 1930, production dropped to 15,221,636 bbl., and in 1931 was down to 12,221,123.

"In 1929, the total barrel production for the Pennsylvania Department of Highways' contracts was 558,355. In 1930, deliveries amounted to 992,993 bbl. and in 1931 they dropped to the low level of 219,567 bbl. In other words, Pennsylvania highway department contracts consumed three-quarters of a million less barrels of cement in 1931 than in 1930.

"Our figures on total man-hours in the cement industry of this district show 8,883,538 for 1929; 7,581,700 for 1930 and 5,759,983 for 1931. This is a reduction of 1,721,717 man-hours in 1931 as compared with 1930. Curtailed production in two of our large mills from which data was not obtained would easily show the total reduction in this district to be in excess of 2,000,000 man-hours. (This figure does not include loss in man-hours as a result of decreased deliveries to Pennsylvania Department of Highways by mills in other sections of the state.)

"Carrying this a step farther, production statistics show that 136 lb. of coal are required to produce a barrel of cement. The more than 750,000-bbl. loss between 1930 and 1931 in highway contracts alone would have consumed 52,640 tons of coal in the making—coal that would have been mined in Pennsylvania by Pennsylvanians, and hauled to the mills over Pennsylvania railroads. To this could be added the many tons of limestone, gypsum and other cement ingredients, and the outgoing freight to all parts of the country. Continued production and shipments of these materials would have had a beneficial effect on general employment throughout the state."

Indiana Accepts Bids on 1,800,000 Bbl. of Cement

Contracts for 1,800,000 barrels of cement to take care of 1932 needs of the Indiana Highway Commission have been awarded to six companies.

The Lehigh Portland Cement Co. plant at Mitchell, Ind., will supply 450,000 bbl. Other plants sharing in the awards were Lone Star Cement Co. Indiana, Limedale, Ind., 475,000 bbl.; Wabash Portland Cement Co., Stroh, Ind., 150,000 bbl.; Louisville Cement Corp., Speed, Ind., 400,000 bbl.; Marquette Cement Manufacturing Co., LaSalle, Ill., 200,000 bbl.; and Kosmos Portland Cement Co., Kosmosdale, Ky., 225,000 bbl.

Oregon Portland Cement Plant Works at Capacity

The Oregon Portland Cement Co. plant at Lime, Ore., is operating at capacity, putting out 1,200 bbl. daily. Orders are on hand to assure continuous operation for at least six months, according to reports.

Sixty men are employed at the plant, which recently began production of a new 207,000-bbl. order for the U. S. reclamation service to be used on the Owyhee Dam project.

Last year, with an output of 431,000 bbl., was the biggest year in the history of the plant.

Preliminary Data on Sand, Gravel Census

PUMP DREDGING PREDOMINATES

While the final report of the Bureau of the Census regarding the sand-and-gravel industry is not yet available, some of the preliminary data are interesting.

In making up these data, the bureau did not include those companies whose production was less than 25,000 tons annually. Only materials that were washed and screened were considered and special sands, such as glass, molding and filter sands were not included.

It is of interest to note that, of 1,165 plants, 308 are of the pump-dredge type, 234 use drag-lines only to excavate material, while 227 establishments depend entirely upon power shovels. Complete figures are given in the accompanying table.

The data, which cover the industry for the year 1929, show the aggregate horsepower employed to be 516,745.

Type	Number of Enterprises	Number of Plants	Annual Production (*tons*)	Value
Shovel only	227	274	43,165,000	$25,341,000
Shovel and drag-line	73	91	16,090,000	7,688,000
Shovel and dredge	36	46	9,995,000	5,520,000
Drag-line only	234	275	25,180,000	14,877,000
Drag-line and dredge	37	59	7,379,000	4,607,000
Pump dredge	266	308	42,505,000	24,008,000
Ladder dredge	58	63	16,471,000	12,719,000
All other	26	49	8,101,000	7,553,000
Total	957	1,165	168,886,000	$102,313,000

Iowa Producer Awarded Contract for Road Work

The Empire Sand & Material Co., of Marshalltown, Ia., will furnish crushed stone and gravel for the construction of 19 miles of paving in Grundy County, Iowa. W. S. Keller, head of the Empire company said that crushed stone and gravel will come from its Le Grand and Alden quarries while gravel will be taken from pits at Iowa Falls. The contract calls for approximately 40,000 tons of crushed stone and 5,000 tons of gravel.

Acquires Crushed-Stone Properties in Georgia

The Saluda Crushed Stone Co., Walker Building, Greenville, S. C., is reported to have acquired a portion of the plant and deposit of the Elberton Quarries, Inc., Elberton, Ga., and will operate shortly.

Gravel Company Submits Low Bid to Widen Road

The Hersey Gravel Co. of Hersey, Mich., was low bidder for the widening of a stretch of the concrete-paved Dixie Highway near Saginaw, Mich., recently.

The company's bid of $152,691 for the project was nearly $4,000 lower than that of the next lowest bidder.

This is divided as follows: Electric motors driven by purchased power, 285,548 hp.; internal-combustion engines, 72,207 hp.; steam engines, 158,150 hp.; steam turbines, 740 hp.

It is also shown that the industry generated 7,594,828 kilowatt-hours, and purchased 237,679,291 kilowatt hours of electric power at a cost of $4,921,398 for the purchased energy.

Total cost for fuel during the year was $3,989,503. This was represented by 601,588 tons of bituminous coal, 3,804 tons of anthracite, 133 tons of coke, 16,909,461 gallons of fuel oil, 5,708,451 gallons of kerosene and gasoline, 82,213,000 cu. ft. of natural gas and 52,560,000 cu. ft. of manufactured gas.

Get Hoover Dam Cement Contract; $650,000 Total

Two contracts for furnishing cement to be used on the Hoover Dam have been officially awarded.

The Riverside Cement Co., California Portland Cement Co., Southwestern Portland Cement Co. and Monolith Portland Cement Co. of Los Angeles, on their combined bid of $605,200, received one award, and the other contract was let to the Utah-Idaho Cement Co. of Salt Lake City on its bid of $44,800.

Hoover Dam Gravel Plant Nearly Ready

LOCATED 7 MILES UP RIVER

Officially reported to be six months ahead of schedule, work on the Hoover Dam contract is still progressing at the rapid pace that has characterized the work of the contractors since the start of the job, according to a brief survey made this week.

Track-laying on that portion of the Six Companies railroad leading to the sand-and-gravel plant and to the river has been completed to the gravel plant. The plant proper has been completed and has been thoroughly tested in operation.

At the gravel pit, located seven miles up the Colorado River from the dam site, on the Arizona side of the river, drag-lines have been put in operation preparatory to the actual excavation of the aggregates, first production of which is to be used in the concrete for lining the diversion tunnels.

Mixing of the concrete will start with the completion of the low level mixing plant, which will be completed shortly, and will be in readiness for supplying concrete well in advance of schedule.

To Ship 100,000 Barrels of Cement into Panama

Movement of 100,000 bbl. of cement from Houston, Tex., to the Panama Canal zone for use in the construction of a huge dam at Gatun Lake is in prospect this spring, the cement coming from the plant of Lone Star Cement Co., Texas, a subsidiary of the International Cement Corp.

President H. Struckmann went to Houston from New York recently to confer with port officials concerning the shipment. International had previously moved 100,000 bbl. to the Panama project—50,000 from New York and 50,000 from Houston.

Aggregate Producers in Iowa Discuss Prospects

More fitting recognition of Iowa's commercial producers of aggregates by the state's highway commission was urged at a meeting held February 19 of the Iowa Aggregates Producers' Assn. held at Des Moines, Ia. It was brought out in the discussion that a pronounced lack of coöperation has existed between these organizations due evidently to the failure of the highway body to appreciate fully the value of the service being rendered by commercial producers who maintain year 'round service and are at all times in a position to furnish aggregates to meet any specification. It was pointed out that there seems to exist an overzealousness on the part of the Iowa Highway Commission to prospect for new deposits and to attempt to interest new capital in the not-too-prosperous business of producing materials in times of economic distress as now exist. In 1930, it was declared, Iowa producers were easily able to supply material for the state's 1,085-mile paving program, together with considerable improvement to secondary roads. With only 190 miles of paving scheduled for this year, Iowa's existing plants would not be pushed to anywhere near capacity output, without encouraging any new capital or "fly-by-night" operators to engage in business.

About 75 per cent. of the producing capacity was represented at the meeting, according to S. P. Moore, secretary-treasurer.

British Columbia Gypsum Plant Faces Active Year

Three hundred carloads of gypsum blocks and hardwall plaster, a carload each working day, will be shipped this year from the New Westminster, B. C., plant of Gypsum, Lime & Alabastine, Canada, Ltd., to enter into the construction of the new Canadian National Hotel now being erected in Vancouver, B. C.

Pennsylvania Producer Doubles Plant Capacity

Doubling the capacity of their crushed-stone plant during the winter shut-down, Narehood Brothers of Milton, Pa., are preparing to resume production for the season. A new gyratory crusher capable of handling 1,500 tons of material daily has been installed. The enlarged plant is to be completely electric-driven, power being obtained from the lines of the Pennsylvania Power & Light Co.

Marquette Cement Barge Line Again in Operation

Cement shipments by barge were resumed last month by the Marquette Cement Manufacturing Co. from its loading wharves at Peru, Ill. Stock is being shipped southward over the Illinois and Mississippi Rivers for consignment to the company's packing and distributing stations located at several strategic points on the Mississippi.

Marquette engineers are reported to have now completed plants for the expansion and improvement of the loading facilities at the Peru terminal. Approximately $25,000 will be expended, it is reported.

Indiana Producer Seeks Big Excavating Contract

The O'Donnell Sand & Gravel Co. of Vincennes, Ind., has submitted a low bid for the grading and excavating of 25,000 cu.yd. of material for the proposed George Rogers Clark Memorial grounds at Vincennes.

The company submitted a figure of 38 c. per cu.yd.

U. S. Gypsum Co. Busy Developing New Lines

OFFSETS DROP IN BUILDING

Partly to offset results of the decline in building activity, the United States Gypsum Co. has been developing new uses for its products. As a part of this program it is understood to have equipped one of its larger plants and is installing facilities in some of the others for pulverizing gypsum fine enough to be used as a filler in making paper. Although gypsum has been used in paper manufacturing for a number of years, the amount consumed for this purpose has been relatively small because manufacturers were not equipped to produce it in large quantities in the proper form. There is an extensive market in the paper industry for gypsum filler as it is said to be better for this purpose than the more expensive imported China clay ordinarily used.

The company spent $2,061,297 for plant additions, last year, of which $880,449 was expended for the purchase and improvement of a lime plant at Guelph, Ontario; the construction of a complete gypsum unit at Hagersville, Ontario, including mine, mill, wallboard and block plant, and the addition of a wallboard unit to its recently acquired gypsum property at Hillsborough, New Brunswick. These plants all are now in operation. The company also spent $1,180,848 for additions and improvements to its metal lath and insulating board plants and for the maintenance of its other American properties.

A part of the company's research, last year, was devoted to the development of a wallboard which could be manufactured at a smaller unit cost. The company made considerable progress along this line and has increased the number of items in its line of wallboard and insulating board. This line is an important source of revenue during periods when new building volume declines and remodeling and repairing make up a large part of total construction volume.

While primarily a manufacturing company which distributes its products through dealers, the company is in a position to give advice and assistance to distributors who enter the unit-housing field. The company built a number of houses in Chicago several years ago of a gypsum cement, called "structolite," which dries quickly and does not draw moisture during cold, damp weather. The company also developed plans and made forms for pouring cement homes, although the cost of construction was not materially reduced by this method. This indicates, however, that the company is alert to new developments in the housing industry and will be an important factor in the future.

Glass-Brick Houses Are Being Developed

GREAT POSSIBILITIES SEEN

The Owens-Illinois Glass Co. has moved its experiments with glass brick from Evansville, Ind., to its Columbus, O., plant. Research engineers of the company are studying a small house built entirely of the glass brick which is produced from silica-sand.

Officials state they expect a large development from the new product. Large oil companies have been interested in the experiments and filling stations and novel retail stores may be constructed soon of the glass brick in solid or mixed colors to attract attention during the day or at night when they are lighted. In addition, the glass bricks are expected to be used in many buildings for roofs and the upper walls to provide natural daylight.

The bricks are made both solid and hollow, the latter type providing insulation in addition to transmitting light.

Cement Workers Resume Tasks After Shut-Down

The Howes Cave, N. Y., plant of the North American Cement Corp., has been reopened following a 60-day shutdown period. A total of 110 workmen have been recalled to the mill and officials of the plant have declared that they hope to keep up operations on a reduced scale throughout the season.

Seasonal conditions caused the plant to close and the usual repair and servicing of equipment was done during the interim.

Acquires Indiana Stone Plant; to Raise Output

Meshberger Bros. Stone Co. of Linn Grove, Ind., has acquired the crushed-stone plant and quarry of the Blue Creek Limestone Co., located near Decatur, Ind.

The quarry has been operated for the last ten years. The new owners have announced that new equipment is to be installed to permit an annual capacity of 100,000 tons of material per year.

Crusher installation in Chicago water tunnel.

Erects Marble Mills in Far West and Vermont

A new combination shop and mill, being erected to handle its increasing marble business on the Pacific Coast, is being completed at San Francisco by the Vermont Marble Co. The mill will have three gang-saws for sawing marble blocks from the company's quarries in Alaska, Colorado and Vermont. The finishing shop will be equipped with rubbing beds, carborundum machines, polishing units and other modern machinery for marble finishing.

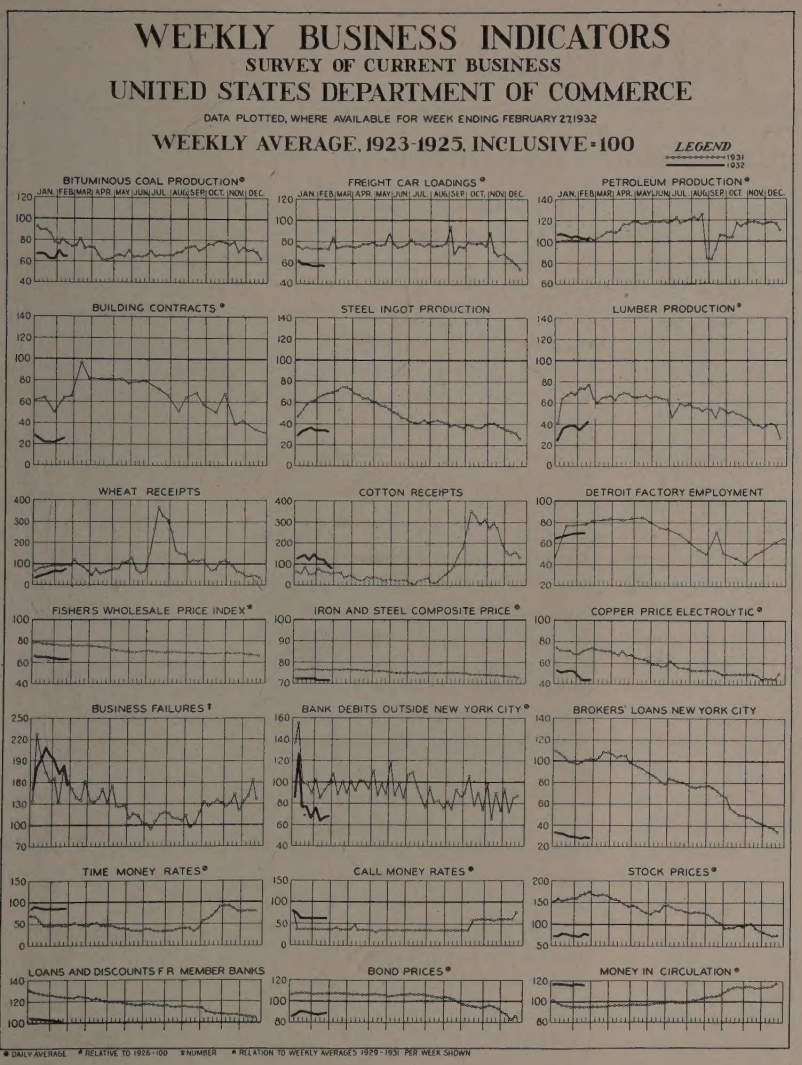
The Vermont Marble Co. is also erecting a new finishing plant at Proctor, Vt., for finishing exterior marble.

Stone from Tunnel Used in Concrete Production

Construction is proceeding on two huge water-intake tunnels at Chicago, the stone removed from the tunneling being converted into aggregates for the concrete used in lining the tubes. One of the tunnels is 16 ft. in diameter and will be approximately 8½ mi. long. The other will be smaller—10 ft. in diameter and about 3½ mi. in length. The plant is simple and consists of a 75-ton, 100-hp. Williams hammer-crusher supplied with material by a pan conveyor fed from an elevated hopper. The stone excavated from the tunnels is brought to the hopper by cars of 2-cu.yd. capacity equipped with hinged bottoms. A hoist lifts the bodies from the car trucks, dumps the stone into the hopper and returns them empty to the trucks. The same cars are used on the return trip to transport the crushed material to the mixer. No screening is done.

BUILDING PERMITS ISSUED IN 563 CITIES FOR JANUARY, 1932, SHOWING COMPARISONS WITH JANUARY, 1931, AND DECEMBER, 1931

State	Jan., 1932	Jan., 1931	Dec., 1931	State	Jan., 1932	Jan., 1931	Dec., 1931
Alabama	$ 101,436	$ 485,032	$ 121,786	Nebraska	$ 69,545	$ 182,918	$ 381,980
Arizona	68,649	277,414	191,025	Nevada	25,750	201,400	21,425
Arkansas	30,604	110,766	911,873	New Hampshire	34,066	2,438	25,250
California	5,283,368	12,775,971	6,594,278	New Jersey	2,296,442	2,291,608	2,682,903
Colorado	359,942	573,309	244,300	New Mexico	24,600	106,550	57,015
Connecticut	1,525,583	1,255,439	1,487,304	New York	17,207,827	41,774,002	15,054,181
Delaware	318,930	262,166	67,648	North Carolina	133,911	208,819	800,073
Dist. of Columbia	1,304,725	1,816,700	925,785	North Dakota	10,680	18,717	65,850
Florida	457,287	575,863	521,216	Ohio	4,215,956	3,857,476	1,654,221
Georgia	250,610	418,744	181,018	Oklahoma	213,830	3,682,271	226,782
Idaho	6,620	14,400	5,235	Oregon	436,725	736,581	234,148
Illinois	709,618	4,045,574	4,419,262	Pennsylvania	1,499,029	2,701,470	2,028,652
Indiana	300,565	3,016,719	610,948	Rhode Island	296,509	903,103	411,273
Iowa	236,724	580,479	480,028	South Carolina	69,013	400,536	191,358
Kansas	92,085	310,780	110,783	South Dakota	17,500	101,740	280,175
Kentucky	106,142	647,390	1,885,479	Tennessee	360,040	789,464	1,566,474
Louisiana	169,697	318,871	176,212	Texas	1,804,056	3,712,206	2,653,016
Maine	52,385	23,610	54,804	Utah	29,685	72,100	90,249
Maryland	1,033,980	1,405,333	829,825	Vermont	11,000	.....	None
Massachusetts	1,975,360	3,394,980	2,570,553	Virginia	433,381	584,866	209,669
Michigan	583,268	6,914,327	901 347	Washington	1,911,638	1,773,495	433,121
Minnesota	645,856	1,195,860	3,103,424	West Virginia	119,797	215,705	128,381
Mississippi	38,038	82,295	16,095	Wisconsin	1,002,161	1,642,974	720,457
Missouri	622,410	2,200,343	899,149	Wyoming	1,698	38,760	12,310
Montana	28,630	44,130	54,350				
				Totals	$48,516,351	$108,745,694	$57,293,140



All Officers Reëlected by Glens Falls Company

All officers and directors were reëlected at the annual meeting of the Glens Falls Portland Cement Co. held recently. The officers are: President, George F. Bayle, Sr.; vice-president, George F. Bayle, Jr.; secretary, Frank W. Waite; treasurer, Robert C. Carter.

Directors of the company include Frank W. Waite, Theodore F. Kalbfleisch, Sr., Robert C. Carter, Byron J. Lapham, George F. Bayle, Sr., George F. Bayle, Jr., and Frank J. Monaghan.

Utah Materials Men to Spur Activity in State

A vigorous effort to bring back prosperity to Utah is to be made by a newly-organized state-wide association of cement men, architects, brick and clay firms, lumber men, plumbing supply companies, general contractors, and others interested in the building industry.

The first meeting was held at the Chamber of Commerce in Salt Lake City on February 11 with a prominent Salt Lake City architect in the chair. A committee was appointed to draw up articles of association, select a permanent name for the group and to outline a plan of action. The association will be known temporarily as the Utah Building Congress. The committee has a labor leader as one of its members.

It is hoped to have the campaign under way early in March. Much is expected from this new organization because it gives promise of meaning business. Herbert A. Snow, secretary-treasurer of the Portland Cement Co. of Utah, Salt Lake City, represented the cement industry at the meeting.

Irrigation Project Buys Cement at $2.20 a Bbl.

Superior Portland Cement, Inc., of Concrete, Wash., has been awarded a contract for supplying 1,250 bbl. of cement for the erection of a new pumping plant at the Wapato, Wash., irrigation project, to be built this spring.

The price was $2.20 per bbl.

Labor Gets 91 Cents of Each Road Dollar

INTERESTING FACTS REVEALED

Labor gets $910, or about nine-tenths, of every $1,000 received by the contractor in building a concrete pavement, according to a statement issued by Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, in testifying recently at the hearings of the Senate Committee on Appropriations.

This statement, resulting from an extensive study of all the costs of building concrete pavement, was a part of Mr. MacDonald's testimony showing the value of road building in providing jobs for the unemployed.

Mr. MacDonald explained: "The fact that so much of the road dollar, from 85 to 90 per cent., goes into labor, either directly or indirectly, is due to the fact that there are no intrinsically valuable materials used in road building."

The data presented by Mr. MacDonald show that of the $1,000 given to the contractor for building concrete pavements, $141 is spent directly by him for labor on the job. An additional $44.70 is spent for labor by him in getting on the job and for other miscellaneous items.

The contractor pays plants and quarries $675, which along with $139.30 spent by the contractor through other agencies, is distributed so that labor eventually receives another $724.30, making a total of $910 received by labor from each $1,000. This money is expended for wages in mills and quarries, in transportation of materials and equipment, in the production of fuel, in the manufacture of supplies and equipment, and so on.

In commenting on the fact that labor receives such a large portion of the money required for concrete pavement building, road builders point out that labor benefits as much in high-type pavement building, with extensive use of machinery, as in the construction of low-type roads where comparatively little machinery is used.

Purchases Towboat and Barges for Sand Plant

The Alpha Portland Cement Co. is reported to have arranged for the purchase of a Diesel-powered towboat and four steel barges for use in transporting sand and gravel from the aggregates plant operated by the company's affiliate at St. Louis, Mo.

To Transfer Plant from Iowa to Superior, Wis.

The N. P. Mogenson Co., manufacturer of concrete blocks in Fort Dodge, Ia., will move its plant to Superior, Wis., early in April, according to reports.

Editorial

Unemployment Relief Through Federal Aid

THE adverse report of President Hoover's Committee on Unemployment Relief on the proposal that the federal government should appropriate larger sums for public works has occasioned much comment, favorable and unfavorable, as was to be expected. Too much of the comment, however, seems to have been influenced by considerations that have no bearing on the intrinsic merits or demerits of the idea. Even the report of the committee reflects the influence of opposition that does not touch the heart of the matter but appears to have been guided more by party and other feeling.

Of course, the committee has not ignored the plausible reasons for opposing the appropriation of large sums for public improvements. It objected that federal aid would help districts that need no assistance, that the construction industry alone would benefit, that the states' sense of individual responsibility would be lessened through federal aid, that years would be required to repay the huge indebtedness that would be incurred, that a federal bond issue of the necessary size (possibly $5,000,000,000 or more) would reduce still further the prices of existing bonds by absorbing much of the country's liquid assets, and so on. All which appear to be the arguments of men who are determined to oppose the adoption of the suggested method at all costs, even at the cost of reasonableness, as is sufficiently shown by the committee's statement that, "In considering the relation of these [federal-highway] expenditures to present unemployment, the real question is not the need of more money but rather the expenditure of money at places where emergency may exist."

In answer to the statement just quoted and the objection first stated, one might reasonably inquire for a list of the districts where unemployment relief is not needed. In spite of reports from every quarter of the country, indicating the nation-wide nature of unemployment, the committee would have us believe that the problems arising from unemployment are purely local and, therefore, require local study and relief. By like reasoning the problem can be shifted to counties, to cities, to wards, to neighborhoods, and finally to the shoulders of the unemployed individual himself, where, doubtless, the committee would be glad to let the matter rest. And, wholly apart from the ubiquitous need for employment, are there any parts of the country which do not need some form of public construction? Have the social needs of more than 100,000,000 people been met? Has the field of public improvement been saturated?

In claiming that the construction industry alone would benefit from the proposed federal aid the committee places a very low estimate on the intelligence of those who were expected to read and be influenced by its report, for surely its members can not be so ignorant of finance as to believe that money spent in one industry does not quickly find its way to other industries. If this were true, it would be impossible for the collapse of any single industry or group of industries to cause a general business collapse—the very spectacle we have witnessed during the last few years. We wonder whether the committee is willing to argue this point to its logical ends.

The committee seems to have been fearful that the individual states would lose their sense of responsibility if the federal government were to step in and lend its aid. The states have been the recipients of federal aid in road-building and yet their sense of responsibility seems to be no less than it was before such aid was made available. If this question of individual responsibility is so important—and the committee seems to think that it is—why stop at the states? We might just as reasonably follow the downward line through counties, municipalities, wards, and so on, and come to rest on the individual, as the committee would have us do in the matter of placing the duty of relief according to the need for relief, as already mentioned. We do not doubt that the committee would describe this policy as "fixing the responsibility"; the public will call it "passing the buck."

The committee apparently was much impressed by the forcefulness of the argument that the repayment of the debt incurred by an ambitious program of federal aid would require many years. This is undoubtedly true, but we never heard this offered as an objection to the flotation of huge bond issues for public utilities or other industrial enterprises, which require thirty and forty years to repay their borrowings and sometimes, as in the case of public utilities, continuously borrow from one group of investors to repay another group and so, in effect, never free themselves from debt. If this objection were valid and were applied to all branches of industrial and government activity, there would be few schools and roads, few vacuum cleaners and automobiles.

The possible damaging effect of the proposed federal bond issue upon the prices of other bonds caused the committee needless uneasiness, it seems to us. Since when has the federal government become so solicitous regarding bond prices? Unemployment is one of the reasons for present depressed bond prices, because men who are unemployed are not likely to have surplus funds to invest and, as the number of investors declines, so must the prices of investment securities. And other investors are not likely to invest in new ventures, in new forms of expansion, that threaten still further the security of their existing investments, so it is but natural that bond prices should be depressed.

Aside from providing employment for many

thousands of people—which everyone admits is the great need of the times—a huge program of federal construction would have other advantages. It would bring from hiding many millions of dollars which are now awaiting what the public considers a "safe" investment and a bond issue of the kind proposed would meet the requirements of this definition. Public construction has a great advantage over private construction as a field for investment in that it does not enlarge the commodity-production facilities of the country and, therefore, does not increase the insecurity of manufacturing properties in industries that are badly overcrowded and that suffer from the trials of overexpansion and overproduction. The public might invest $5,000,000,000 in public construction without increasing in the slightest the overproduction problems of a single industry, but it can not invest $1,000,000 in any form of industrial enterprise at this time without aggravating the conditions of overexpansion and overproduction from which nearly every industry suffers. This fact alone should be a strong stimulus in encouraging the public to buy public-construction bonds.

Critics outside the committee have objected to the increase in taxation which they have asserted would inevitably result from the adoption of such a program and the effect which this would have upon the wage-funds of employers. We believe that this point has been unnecessarily pushed. In the first place the practice of keeping cash reserves to meet pay-rolls is not a common one even in prosperous times, most employers finding it easier and cheaper to borrow when and as their requirements indicate, rather than to accumulate inactive wage-funds. Secondly, the increase in taxation necessitated by the proposed federal bond issue would, as in other cases of public borrowing, be negligible and, therefore, would not have a serious effect on wage-funds, even if these were numerous and large.

Much of the criticism of the proposed federal aid comes from those who fear a curtailment of their business through the adoption of such a program. Chief among these are the investment bankers who have at least two causes for uneasiness. If the proposed bonds were sold by the government without the aid of investment bankers—which is quite within the realm of possibility, in spite of the pressure which investment bankers might exert to obtain private selling—the financial organizations would lose the profit which would normally come to them from the sale of an equal amount of private bonds or even state, county, and municipal bonds, which are commonly disposed of through the usual investment channels. Another cause for concern arises from the fact that the money invested in federal bonds would not be available for investment in other types of securities on the sale of which investment bankers take a profit and there would be less activity in the bond market and correspondingly less profit for them.

As we have often pointed out, there can be no business recovery without an improvement in the purchasing power of the multitude and this can only be brought about by increasing their earning capacity. For the unemployed this can be accomplished only through employment. Hundreds of millions of dollars are in hiding and they can not be brought out and put in circulation except through a restoration of confidence in investment opportunities. What type of investment could make a stronger appeal to the mistrustful investor than a federal bond issue, which promises not only to employ large numbers of people (and so bring thousands back into the ranks of normal consumers), but promises to do this without setting up new industrial problems (new enterprises, further and unwarranted expansion of old enterprises, and in both cases increased competition, reduced prices, and reduced employment)?

Many of the inequalities in the distribution of wealth might be eradicated through a federal bond issue of the kind that has been proposed, and many economists agree that one of the chief sources of our present difficulties is the unbalanced distribution of our cash resources. Much of this cash is being hoarded instead of being spent, and to bring it forth and put it to work is one of the big tasks in accomplishing business recovery. A large federal bond issue for public construction is, in our opinion, one of the best means for accomplishing this at the same time that it provides employment to large numbers of people who, through unemployment, have been withdrawn from the ranks of normal commodity consumers.

Leap Year Fails to Mar Universal Atlas' Perfect Safety Record

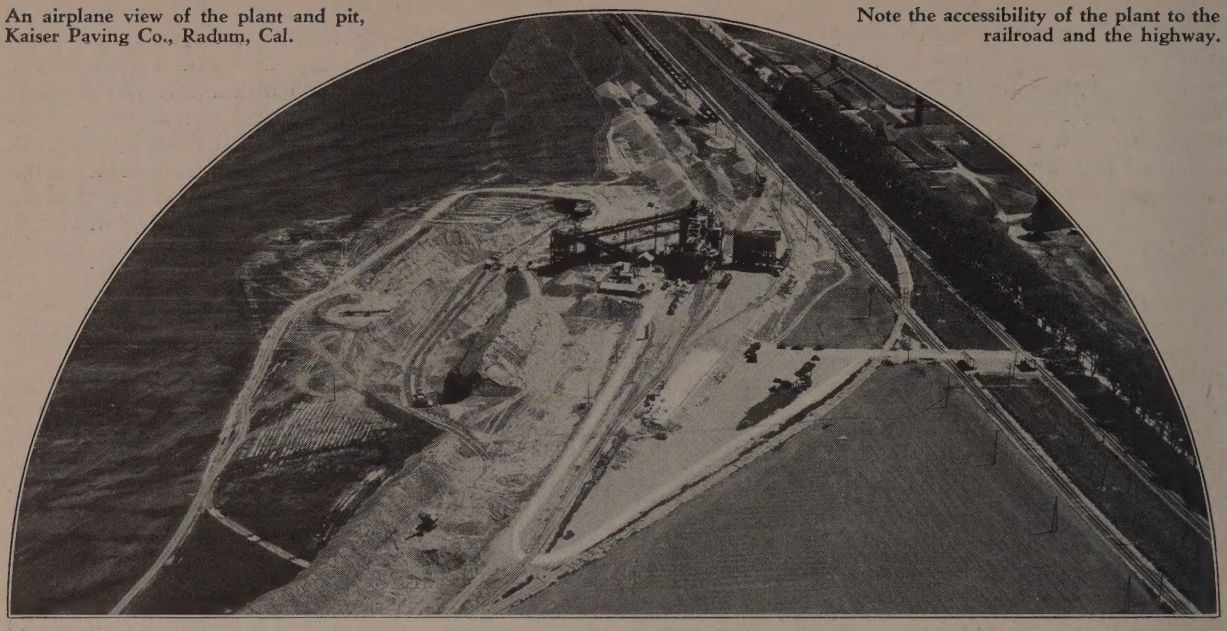
"Although Leap Year caused February to have one extra day, this fact did not spoil the perfect record of no lost-time accidents by the many thousands of workers in all thirteen plants of the Universal Atlas Cement Co.," announced B. F. Affleck, president of the company, a subsidiary of the United States Steel Corp.

"Even more noteworthy," Mr. Affleck said, "is the fact that three plants have each come through their fourteenth consecutive month without a single lost-time accident." These plants, located at Northampton, Pa.; Leeds, Ala.; and Independence, Kan., will receive trophies from the Portland Cement Assn. for their perfect annual records made in 1931. Plans are now being made for formal presentation of the trophies. Dedications will take place at each plant some time within the next few months.

"Three things are responsible for the achievement of these records," said Gordon C. Huth, safety director of the Universal Atlas company. "First, modern safety equipment is installed wherever needed to protect our workers. Second, thorough responsibility is assumed by operating officials and supervisory forces. And finally, intelligent coöperation is given by every member of the organization."

An airplane view of the plant and pit, Kaiser Paving Co., Radum, Cal.

Note the accessibility of the plant to the railroad and the highway.

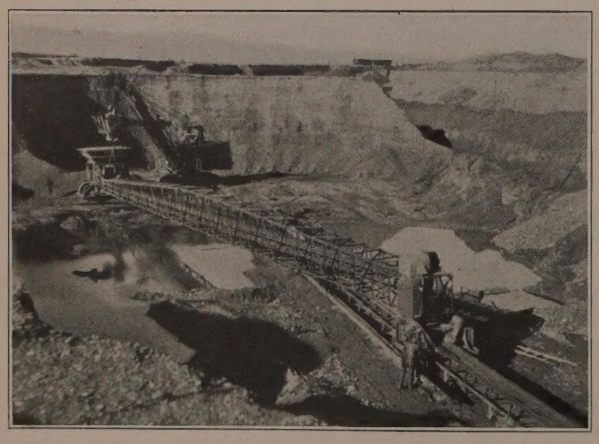


Accurate Grading and Thorough Washing Accomplished at This Plant

Radum, Cal., Operation of Kaiser Paving Co. Sets Example for Producers on West Coast

By W. E. TRAUFFER

THE gravel screening, crushing and washing plant of the Kaiser Paving Co. at Radum, Cal., has been widely heralded as the finest of its kind in existence and from many angles well merits such a designation. It was designed to meet the most rigid specifications for any size or gradation of concrete aggregates and has more than lived up to expectations in this respect. The plant was put into operation in January, 1931, to supply aggregates for the San Francisco territory. It replaces another plant which had been operated by the company for seven years near the same site and is the outgrowth of experience gained at that plant.



Shovel loading portable hopper on swinging conveyor. Method of discharge to field conveyor is shown.

The measures taken to insure accurate grading and thorough washing of the finished product are unusually thorough and result in a product which meets all specifications for uniformity, gradation, and cleanliness. All gravel is washed and dewatered three times in its manufacture, while the sand is rewashed and segregated into various sizes and then remixed into the required final sizes before shipment, allowing a close gradation and blending. The excess gravel is stocked while in the process of manufacture and is rescreened, rewashed and blended before being shipped. No material is blended except as it is being loaded for shipment.

Upon reaching the top of the plant the raw material is first divided into four sizes: plus-2½-in., ¾-in. to 2½-in., ¼-in. to ¾-in., and ¼-in.-minus. From this point on the operation is actually that of four distinct plants which are, however, so tied together as to insure flexibility of operation. The oversize, plus-2½-in., from the screens which produce these sizes is crushed, screened, washed, stored, and loaded separately. The undersize, ¼-in.-minus, goes to the sand plant and is screened, washed, classified, recombined, blended, stored, and loaded separately.

The gravel, which is the principal product, is washed and screened into six sizes, which are stored separately. These can be stock-piled separately or

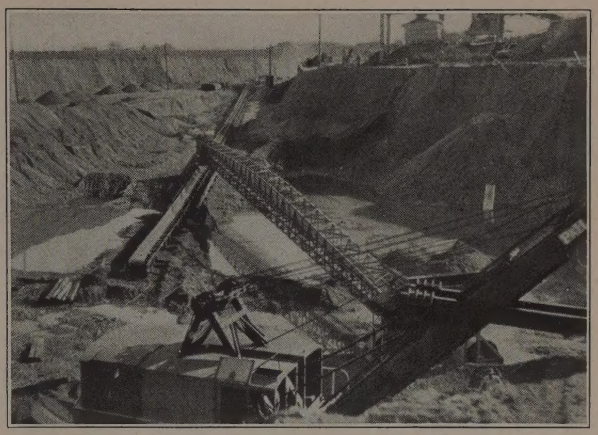
fed one at a time into six loading bins. From these bins the various sizes are passed over vibrating screens provided with sprays to remove any breakage or silt. They are blended into any desired gradation on a perforated loading belt where they receive a final rinsing. The plant also has clean-up facilities which return all waste by gravity to a central point from which it is sent back to the system. The centralized control of all power units is another feature. The plant has a present capacity of 600 tons of finished material per hr.

The plant is almost entirely of reinforced-concrete and structural-steel construction. All bins are of concrete and the only timber used is on walkways, stairways, and railings. The superstructure and conveyor galleries are of steel. In order to secure compactness and the attendant saving in labor and handling of materials, the plant was laid out in the form of a right-angled cross. For this reason each of the conveyors carrying material to the top of the plant is in two units running in opposite directions instead of as the more common single long conveyors. To secure drainage and reduce excavation costs, the plant was built on an 8-ft. fill. This also allows movement of loaded cars from the plant by gravity.

Provisions were made so that the plant can be doubled in capacity at any time at little expense. The conveyors are designed so that belts 1 ft. wider than those now in use can be installed at any time. The screen capacity can also be readily doubled and the necessary steel was installed when the plant was built. Vibrating screens and belt conveyors are used throughout for sizing and handling.

The new Radum plant is located 1 mi. east of Pleasanton on the Livermore-Pleasanton paved highway and about 40 mi. southeast of Okland. It is served by railway connections from the main line of the Western Pacific Ry. and the San Ramon branch of the Southern Pacific Ry.

Deposit and Pit Operations.—The deposit is a part of what is known as the Arroyo del Valle deposit in the Livermore valley, and has long been the

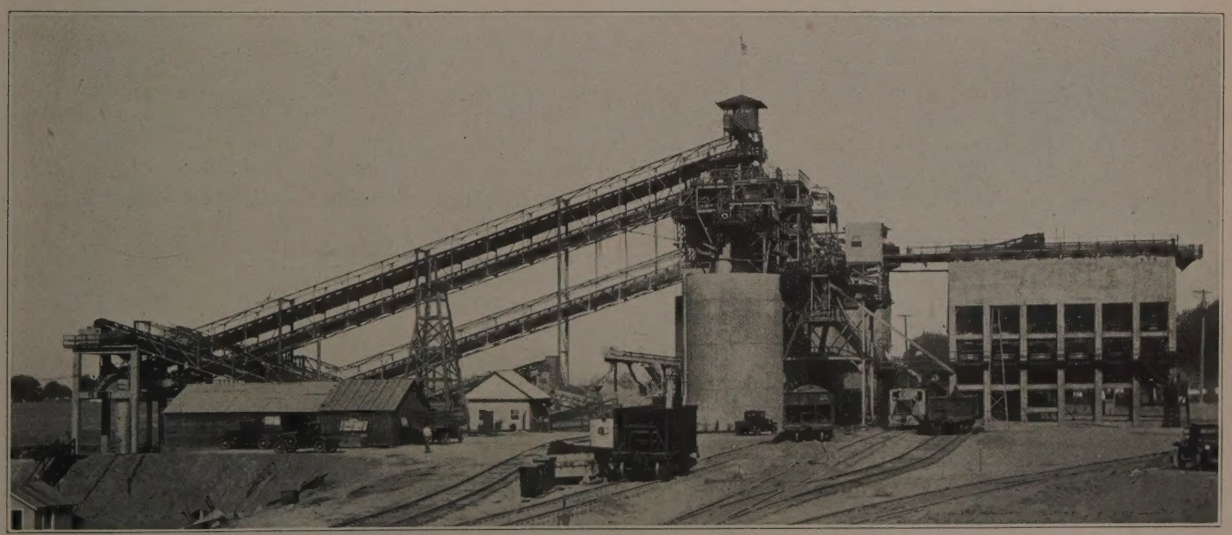


The 3-cu-yd. electric shovel loading gravel to swinging conveyor pivoted from field conveyor. Plant in background.

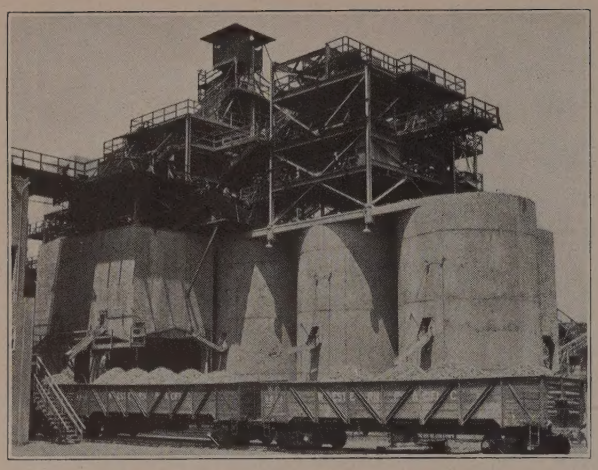
chief source of aggregate supply for San Francisco and vicinity. There were four plants operating on this deposit before this new plant was built, but this one is farthest downstream. As a result the deposit contains more fines than are found at the upper locations. The material runs about 40 per cent. minus-¼-in. with 3 to 10 per cent. over 2½ in. in size requiring crushing. The material running from 1½ to 2½ in. in size averages about 10 per cent. This gradation is well suited to the market demands and is also a factor in the low operating cost claimed for this plant. The deposit is about 50 ft. deep at this location.

The overburden is an eroded material containing about 40 per cent. of fine sand and averages about 4 ft. in depth. This was at first removed with a drag-line but, now that the first cut in the pit is completed, a 60-ft. portable conveyor unit, fed by a Northwest shovel, has been installed. The stripper is mounted on crawlers and is moved around by the shovel.

A 3-cu.yd. P & H electric crawler shovel was used to load gravel into cars in the bottom of the pit. It loaded three 36-ton Western steel air-



The new plant of the Kaiser Paving Co. at Radum, Cal., with pit hopper at left and gravel-loading bins at right.



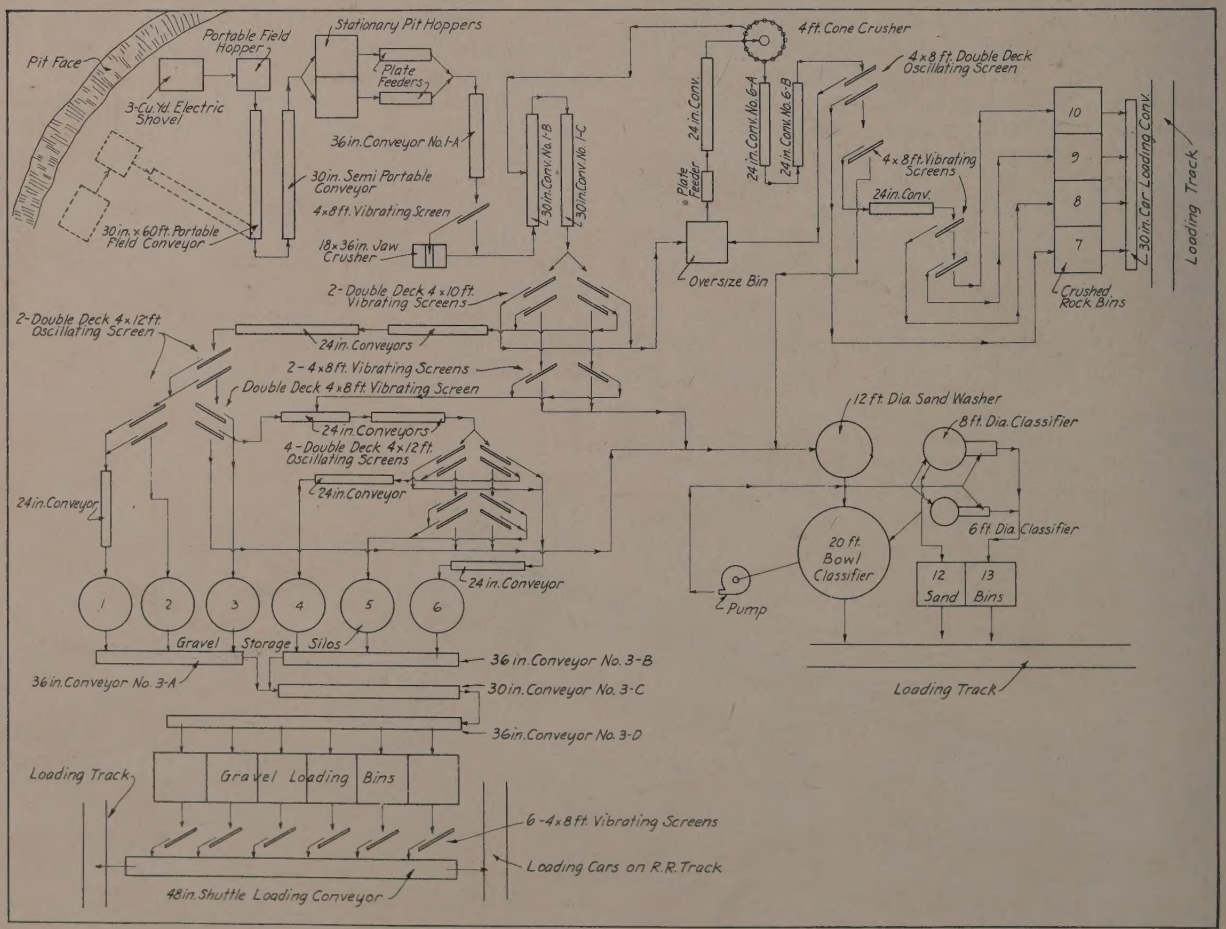
Gravel plant and storage silos with sand plant and bins at left.

dump cars, each drawn by a 10-ton Plymouth locomotive. One of these is gasoline-powered and the other two have Atlas-Imperial Diesel engines. Recently this system of haulage was replaced by a field-conveyor system. This consists of a portable swinging conveyor pivoted at its discharge end and having at its receiving end a small receiving hopper which is fed by the electric shovel. A semi-portable conveyor feeds from the swinging conveyor to the plant hopper. Both are 30-in. conveyors and their frames were made at the plant.

Scalping, Crushing and Screening.—The gravel is discharged from the field conveyor into the steel-lined concrete track hopper which has two four-way-slope compartments of 100-ton capacity, each having a 24-in. by 36-in. discharge opening. Two 24-in. Bodinson reciprocating-plate feeders discharge at right angles to the 36-in. inclined belt-conveyor (No. 1A) which carries the gravel above ground to the plant. This conveyor operates on 252-ft. centers and is driven by a 60-hp. electric motor. A 10-hp. auxiliary motor connected to this drive cuts in and takes part of the load if too much material is fed to the conveyor.

This conveyor discharges to a 4-ft. by 8-ft. Symons rocker bar-type vibrating grizzly with 4-in. openings. The oversize drops to an 18-in. by 36-in. Blake-type Allis-Chalmers jaw crusher which reduces it to minus-4-in. size. The crusher product and the material passing through the grizzly drop to a 30-in. belt-conveyor (No. 1B) operating on 226-ft. centers. This discharges, at a transfer tower near the track hopper, to a second 30-in. inclined belt-conveyor (No. 1C) which operates on 215-ft. centers and carries the material to the top of the screening plant.

The discharge end of this conveyor is located im-



Flow-sheet of Radum operations, Kaiser Paving Co.

TABULAR ANALYSIS OF THE OPERATIONS AND EQUIPMENT OF THE KAISER PAVING CO. PLANT AT RADUM, CAL.

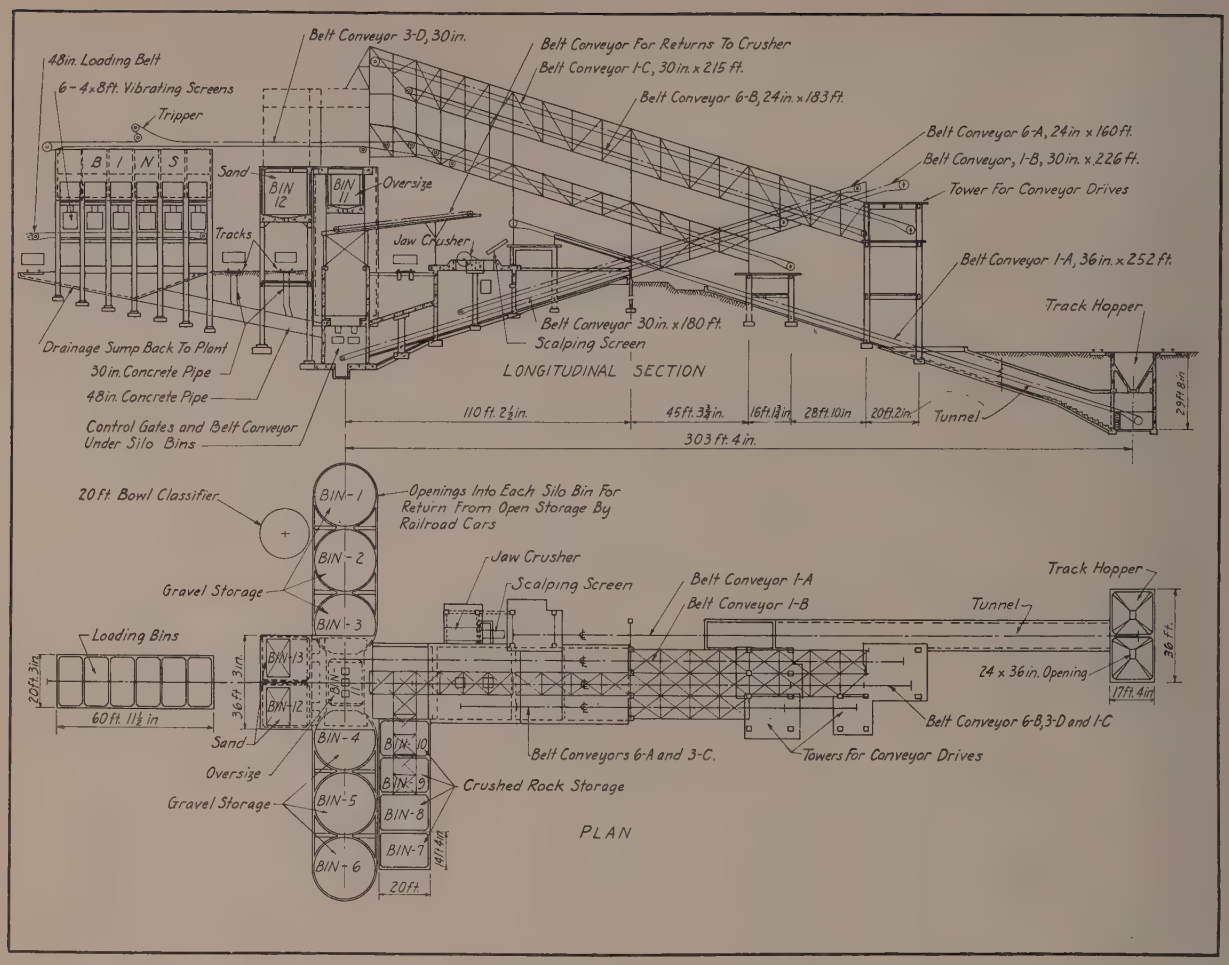
Operation	Equipment	Make	Model No., Size, Capacity or Type	Power Source	Power Transmission
Stripping	Shovel	Northwest			
	Portable conveyor	Link-Belt idlers	30-in. by 60-ft. crawler-mounted		
Loading	Shovel	P & H	3-cu. yd. electric crawler		
	Portable hopper				
	Portable conveyor	Link-Belt idlers	30-in.		
	Field conveyor		30-in. semi-portable		
Raw-material handling, scalping, primary crushing, and separation	Pit hopper		2-compartment, 200-ton		
	Feeders (2)	Bodinson	24-in. reciprocating-plate	7½-hp.	Gear
	Belt-conveyor No. 1A	Bodinson	36-in. by 252-ft.	60-hp. Fairbanks-Morse	
				10-hp. auxiliary	Pacific reducer
	Scalping screen	Symons	4-ft. by 8-ft. rocker-bar type	5-hp. U. S.	Texrope
	Primary jaw crusher	Allis-Chalmers	18-in. by 36-in. Blake type	100-hp.	Belt
	Belt-conveyor No. 1B	Bodinson	30-in. by 226-ft.	50-hp. Sterling	Pacific reducer
	Belt-conveyor No. 1C	Bodinson and Robins	30-in. by 215-ft.	50-hp. Sterling	Pacific reducer
	Screens (2)	Robins Gyrex	4-ft. by 10-ft. double-deck vibrators	5-hp. U. S.	Texrope
Crushed-gravel operations	Oversize bin		80-cu. yd. concrete		
	Feeder	Bodinson	24-in. reciprocating-plate	5-hp.	Gear
	Belt-conveyor	Bodinson	24-in. by 40-ft.	10-hp. Sterling	
	Recrusher	Symons	4-ft. cone	100-hp. G. E.	Direct-connected
	Belt-conveyor No. 6A	Bodinson	24-in. by 160-ft.	20-hp. Sterling	Pacific reducer
	Belt-conveyor No. 6B	Bodinson	24-in. by 183-ft.	25-hp. Sterling	Pacific reducer
	Screen	Symons	4-ft. by 8-ft. double-deck oscillator	5-hp. U. S.	Texrope
	Screen	Niagara	4-ft. by 8-ft. single-deck vibrator	5-hp. Fairbanks-Morse	Texrope
	Belt-conveyor	Bodinson	24-in. by 48-ft.	5-hp. Sterling	
	Screen	Niagara	4-ft. by 8-ft. single-deck vibrator	5-hp. Fairbanks-Morse	Texrope
	Screen	Niagara	4-ft. by 8-ft. single-deck vibrator	5-hp. Fairbanks-Morse	Texrope
	Storage-bins (4)		Concrete, 250-ton each		
	Loading conveyor	Bodinson	30-in. perforated belt	10-hp.	
Ordinary gravel operations	Screens (2)	Robins Gyrex	4-ft. by 8-ft. single-deck vibrators	5-hp. U. S.	Texrope
	Belt-conveyor	Bodinson	24-in. by 15-ft.	5-hp. Sterling	
	Belt-conveyor	Bodinson	24-in. by 30-ft.	5-hp. Sterling	
	Screen	Symons	4-ft. by 12-ft. double-deck oscillator	5-hp. U. S.	Texrope
	Screen	Symons	4-ft. by 12-ft. double-deck oscillator	5-hp. U. S.	Texrope
	Belt-conveyor	Bodinson	4-ft. by 20-ft.	5-hp. Sterling	
	Screen	Robins Gyrex	4-ft. by 8-ft. double-deck vibrator	5-hp. U. S.	Texrope
	Belt-conveyor	Bodinson	24-in. by 15-ft.	5-hp. Sterling	
	Belt-conveyor	Bodinson	24-in. by 50-ft.	5-hp. Sterling	Texrope
	Screens (2)	Symons	4-ft. by 12-ft. double-deck oscillators	5-hp. U. S.	
	Belt-conveyor	Bodinson	24-in. by 24-ft.	5-hp. Sterling	
	Screens (2)	Symons	4-ft. by 12-ft. double-deck oscillators	5-hp. U. S.	Texrope
	Belt-conveyor	Bodinson	24-in. by 24-ft.	5-hp. Sterling	
	Storage-silos (6)		Concrete, 1,250-ton each		
	Gates (6)		Remote-controlled	1-hp.	
	Tunnel conveyors (2) No. 3A and 3B	Bodinson	36-in. by 72-ft.	7½-hp. Sterling	Cleveland worm-gear reducers
	Belt-conveyor No. 36	Bodinson	13-in. by 180-ft.	40-hp. Sterling	Pacific Reducer
	Belt-conveyor No. 3D	Bodinson	30-in. by 153-ft.	50-hp. Sterling	Pacific reducer
	Loading silos (6)		125-ton concrete		
	Washing screens (6)	Robins Gyrex	4-ft. by 8-ft. single-deck vibrators	5-hp. U. S.	Texrope
	Loading conveyor	Stearns	48-in. by 60-ft.	10-hp. Sterling	
Sand operations	Washer	Dorrco	12-ft.	10-hp.	Texrope
	Classifier	Dorrco	8-ft. rake-type	7½-hp.	Texrope
	Classifier	Dorrco	6-ft. rake-type	5-hp.	Texrope
	Classifier	Dorrco	20-ft. bowl-type	7½-hp.	Texrope
	Pump	Wilfley	2-in. centrifugal		Direct
	Storage-bins (2)				

mediately beneath the control tower at the highest point of the plant from which all charging operations are controlled. Water is first applied at this point and the material sluiced through a split chute to two parallel scalping screens. These are 4-ft. by 10-ft. double-deck Robins Gyrex screens with 2½-in. and ⅞-in. wire cloth on their top and bottom decks respectively. The water added in the chute is pumped from the sand-classifier overflow. Jets on these screens also wash the material as it receives its primary separation.

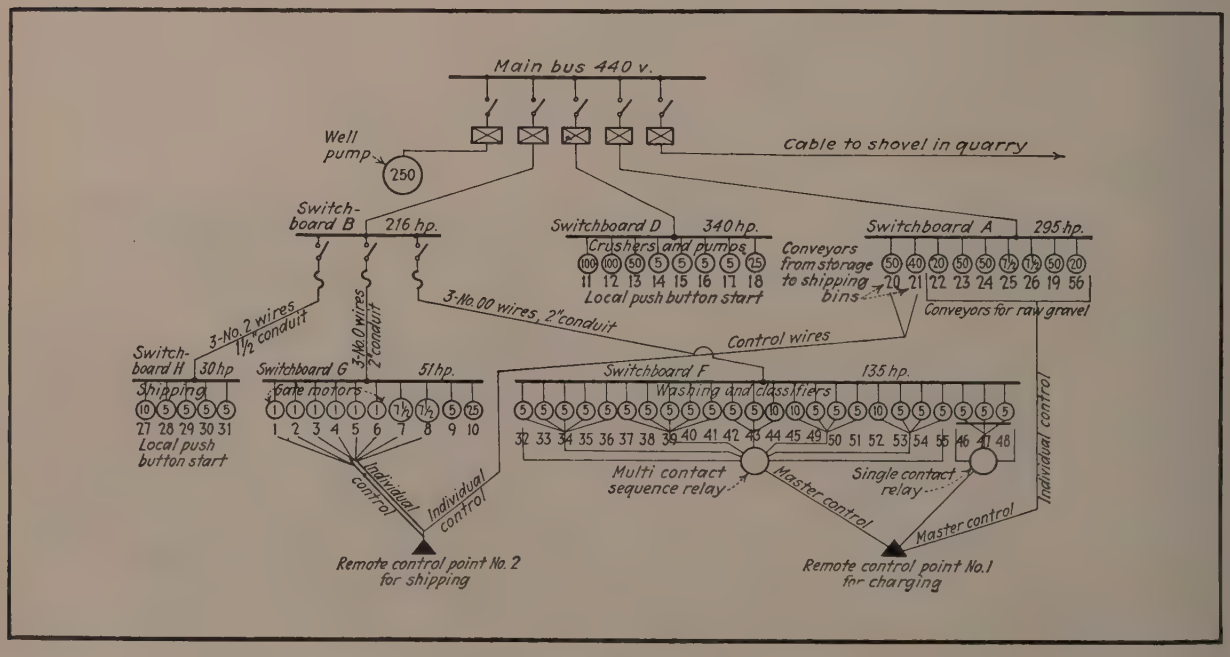
The material retained on the top decks of these screens (plus 2½-in. minus 4-in.) is chuted to a concrete bin from which it can be drawn as desired for recrushing. The material retained on the lower decks (⅞-in. to 2½-in.) goes to a 24-in. belt-conveyor operating on 15-ft. centers. This discharges to a second 24-in. belt-conveyor which operates on 30-ft. centers and feeds to the coarse end of the gravel plant for further sizing.

The material (⅞-in. minus) and water passing through the bottom decks of the scalping screens go to two 4-ft. by 8-ft. single-deck Robins Gyrex screens arranged in parallel below. These screens have wire cloth with .206-in. openings and have special spray nozzles on fine pipes running over both screens to insure clean washing. The water and sand passing through these screens is flumed to a Dorrco 12-ft. sand-washer in the sand plant. The material retained on the screens is fed to two

Pit end of plant with retaining-wall alongside main conveyor under construction.



General plan and elevations of the plant.



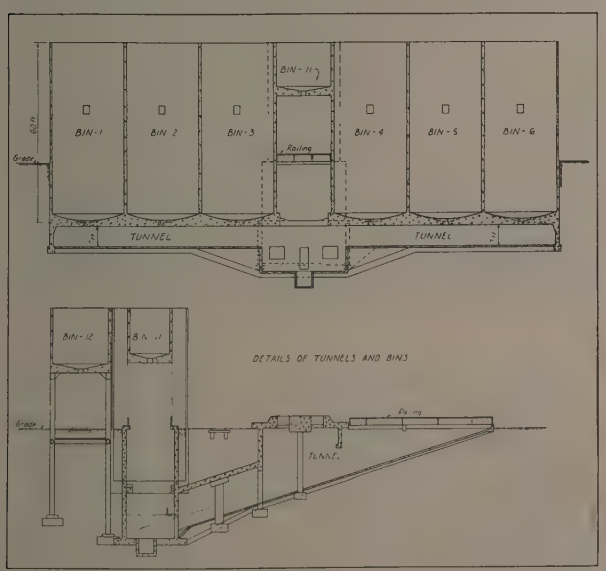
Master diagram of the centralized remote-control system at the Kaiser Paving Co. plant.

24-in. belt-conveyors in series which feed to the fine end of the plant. These are 15 ft. and 50 ft. long respectively.

At the coarse end of the plant the 7/8-in. to 2½-in. gravel is fed to a 4-ft. by 12-ft. Symons double-deck oscillating screen. This has a 1⅞-in. punched-plate upper deck serving only as a scalper and a

Scalping screen, jaw primary crusher and cone recrusher.

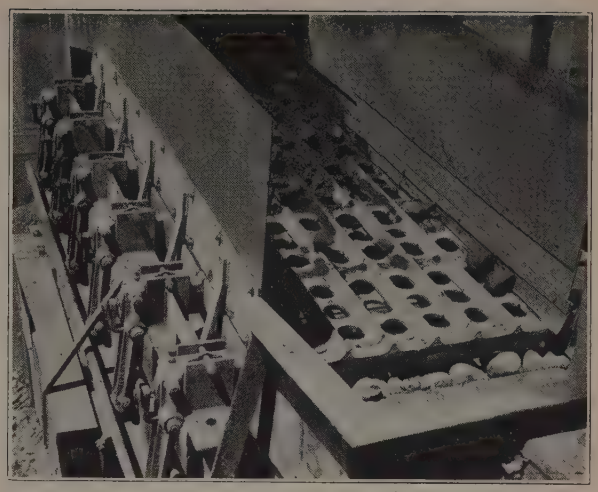
1¼-in. perforated lower deck. The material (1¼-in. to 2½-in.) retained on the two decks goes to a 4-ft. by 12-ft. Symons double-deck oscillating screen with 1½-in. square perforations on the top deck and 1½-in. round perforations on the bottom. This separates the material into two sizes, 1½-in. to 2½-



Cross-sections of storage silos, bins and the reclaiming tunnels.

in. and 1¼-in. to 1½-in. The latter size material is chuted directly to silo No. 2 while the former is discharged to a 24-in. horizontal belt conveyor which operates on 20-ft. centers and discharges to another silo No. 1.

The fine product of the first coarse screen (minus-1¼-in.) passes with the spray water to a 4-ft. by



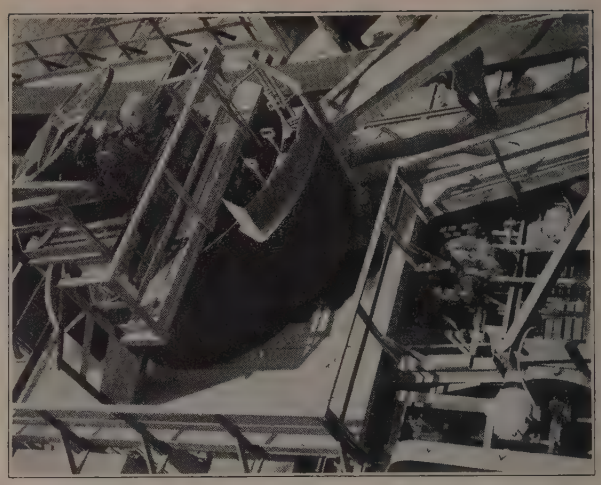
Vibrating grizzly which feeds to the primary crusher.

8-ft. Robins Gyrex double-deck vibrating screen. This has ¾-in. wire cloth on the top deck and .206-in. openings on the bottom deck. The rejects from the top deck (¾-in. to 1¼-in.) are chuted directly to silo No. 3. The sand and water through the bottom deck are flumed to the sand plant. The material (.206-in. to ¾-in.) retained on the bottom deck is discharged to the two previously-mentioned horizontal belt-conveyors which feed to the fine end of the plant.

These conveyors discharge to two parallel sets of two 4-ft. by 12-ft. Symons rocker-arm double-deck oscillating screens arranged in series. The first pair of screens has ½-in. and 5/16-in. wire cloth on the upper and lower decks, respectively. The oversize (½-in. by ¾-in.) from the top decks goes to a 24-in. horizontal belt-conveyor which operates on 24-ft. centers and feeds to silo No. 6. The material (.206-in. to ½-in.) retained on the lower decks is fed to a 24-in. belt-conveyor which operates on 24-ft. centers and carries it to silo No. 4. The material through the lower decks goes to the second pair of 4-ft. by 12-ft. double-deck Symons oscillating screens. These screens have .272-in. openings

Two double-deck oscillating sand screens.

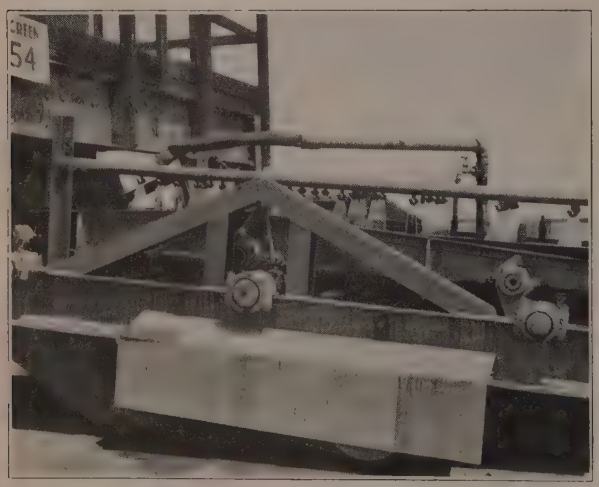
Looking down on the 12-ft. sand washer.



Another washer view; two rake classifiers at right.

on their top decks and .182-in. on their bottom decks. The material retained on the lower decks (.182-in. to .272-in.) goes directly to silo No. 5. That passing through the lower deck (minus .182-in.) is flumed to either the 6-ft. or the 8-ft. classifiers at the sand plant. The rejects from the top decks (.272-in. to 5/16-in.) are also fed to silo No. 5.

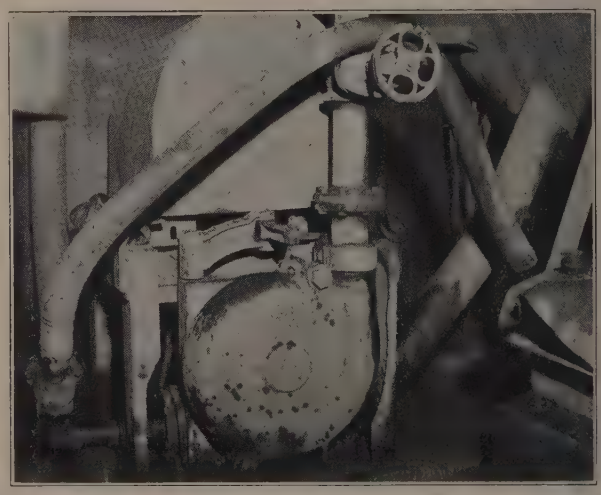
Gravel Storage and Loading.—The six main gravel-storage silos are each 24 ft. in inside diameter and 60 ft. in height, 40 ft. above ground and 20 ft. below. Their total capacity is 150 car-loads or about 7,500 tons of gravel. Rock ladders in the coarse-gravel bins reduce breakage in discharging the material from the screens into the bins. These ladders are composed of 4-ft. sections of reinforced-



One of the two double-deck oscillating fine-sizing screens with spray nozzles used for washing.

concrete pipe which has openings arranged in a spiral and steel baffle plates at 4-ft. intervals to prevent a drop of more than 4 ft. at a time. Gates and chutes above ground level on one side of these bins allow direct discharge into railroad cars for stock-piling. Each bin is also fitted at the ground line with ports and aprons so that material may be brought from the storage piles and dumped back into a bin if it is empty to a point below ground level. No gravel aggregate is shipped direct from storage.

The system described above allows only segregated sizes of aggregates to be stock-piled, as there is no necessity for stock-piling blended or mixed sizes. The extra expense of stocking a blend for each customer and the complications ensuing are



The 4-in. pump which rehandles sand from sump to top of plant.

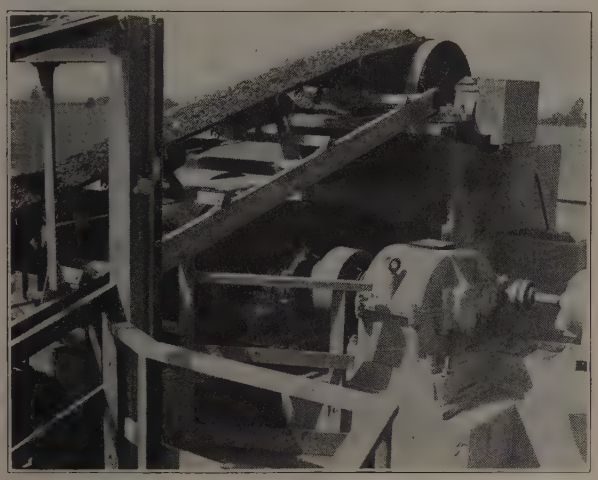
avoided as no material is blended until it is sold and the order for shipping received.

Remote-control bin-gates, designed and made in the plant shop and installed in a concrete tunnel under these silos feed to two 36-in. belt-conveyors (No. 3A and 3B) which operate on 72-ft. centers. Each of these receives the discharge from three silos and discharges under the center of the silo structure on a 30-in. inclined belt-conveyor (No. 3C) operating on 180-ft. centers. This discharges to a second 30-in. belt-conveyor (No. 3D) which operates on 153-ft. centers and discharges to a horizontal distributing belt-conveyor fitted with a Bodinson movable tripper over the loading bins. The six surge or loading bins are at one side of the plant and at right angles to the large silos. They correspond to the six silos in the sizes stored in

them and have a total capacity of 750 tons. These bins are rectangular in shape and have hoppered bottoms.

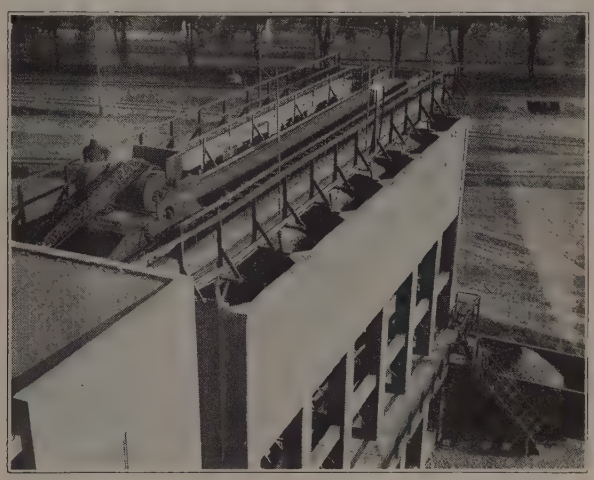
Underneath the loading bins are rack-and-pinion sliding gates which are graduated so that very accurate blending of the different sizes of gravel is possible. These gates discharge to six 4-ft. by 8-ft. Robins Gyrex single-deck vibrating screens (one under each bin), which have openings of the minimum sizes of the material passing over them. The aggregate is again washed on these screens by spray jets which eliminate breakage and erosion fines.

The different sizes fall from the screens on a 48-in. horizontal shuttle loading rubber-belt conveyor operating on 60-ft. centers. This runs parallel with the bins and at right angles to the two loading tracks, one at each end, and has ¼-in. perforations to release water. Sprays give the combined material a final washing, fresh water from the well being used. The loading conveyor discharges over a simple revolving manganese paddle at its discharge end, thus securing a mechanical blend and helping to prevent segregation in loading into railroad cars for shipment. This paddle is driven from the conveyor. As is evident from the above description any separate aggregate or a blend of any of or all the aggregates in any desired grading may be loaded.



Speed-reducer and tandem-pulley drive of one of main conveyors.

Sand-Plant Operations.—The sand from the various screens in the main plant goes directly to the 12-ft. Dorrco sand-washer which dewaters it to about 50 mesh; the overflow and fines going to a 20-ft. Dorr bowl classifier. The product of the washer (50-mesh to 200-mesh) is pumped with the addition of fresh water, and a butterfly valve in the flume splits the flow as desired to 8-ft. and 6-ft. Dorr rake classifiers. A Bodinson classifier, added after the plant had been in operation for some time, is used when there is an excess of sand coming from the pit. These classifiers discharge the sand to two loading bins for shipment.

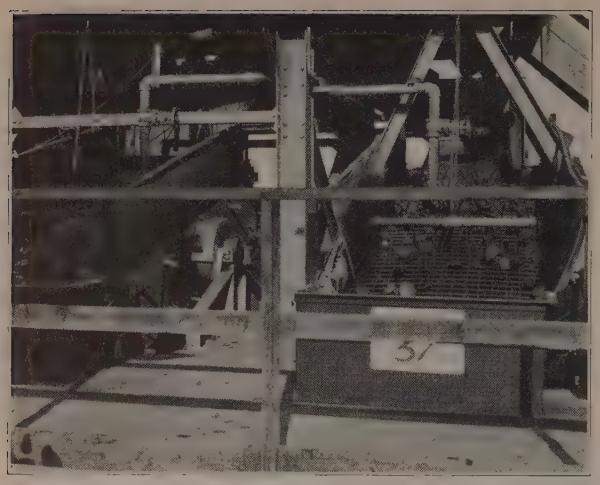


The gravel-loading building with conveyor and traveling tripper.

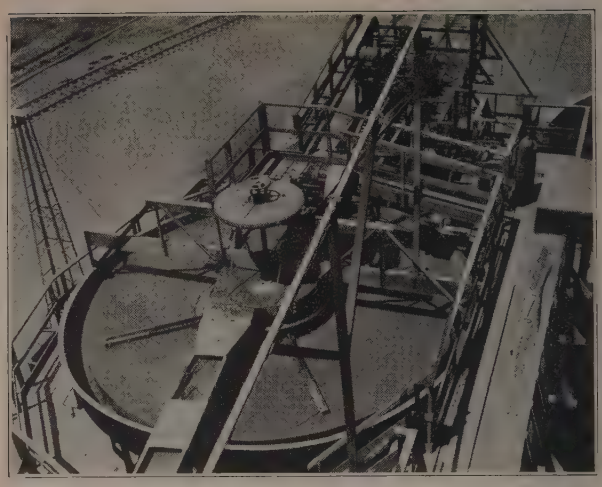
The overflow from the washer and the 6-ft. and 8-ft. classifiers goes to the 20-ft. bowl classifier previously mentioned, the overflow from this classifier being run to a waste pond. The solids (ranging from 40- to 200-mesh) are discharged to the aforementioned 2-in. Wilfley pump, which returns the fines in any desired quantities to the two small classifiers. The fines are mixed with the coarse by the rake action of the classifiers above the pulp line as they are being discharged and a well-mixed sand of any desired grading is thus produced. Any fine

Plate feeder discharging to conveyor to cone recrusher.

One of the two plate feeders under the concrete pit hopper.



Double-deck screens which perform the primary separation.



The 20-ft. bowl classifier used for final separation of sand.

sand not needed for mixing can be spouted directly into a standard-gage railroad car for storage or shipment. Some of the overflow from the 20-ft. classifiers, instead of going to waste, can be returned by another Wilfley pump to the initial scalping screens at the top of the plant for the first washing of the material.

The sand, large coarse particles, from the fine end of the main screening plant is added in the flume from the washer and split to the two smaller classifiers. This, together with the fines pumped into these classifiers, allows any reasonable grading of both fine and coarse sands to be produced simultaneously. The action of the machines, the addition of fresh water, and the thorough dewatering and rewashing, insure a clean, well-graded product free from slime and clay. The two sizes of sand produced are stored in concrete bins under the sand plant from which they are loaded directly into cars.

Control tower with main conveyor from pit at right and split chute to screens below.

Crushed Gravel-Plant Operations.—The crushed-gravel feed-bin, in which the 2½-in. to 4-in. gravel is stored, has a capacity of 80 cu.yd. A Bodinson 24-in. reciprocating-plate feeder feeds from this bin to a 24-in. belt-conveyor operating on 40-ft. centers. This discharges to a 4-ft. Symons cone crusher which is driven by a 100-hp. General Electric direct-connected slip-ring motor. This crusher discharges either on conveyor No. 1B of the main feed-conveyor system to the gravel plant (already described) or on a 24-in. inclined belt-conveyor (No. 6A) which operates on 160-ft. centers and leads to the crushed-gravel plant. The latter belt discharges to a 24-in. belt-conveyor (No. 6B) operating on 183-ft. centers in the same gallery as the main gravel conveyor but below it. This belt discharges to a 4-ft. by 8-ft. Symons double-deck rocker-arm screen for preliminary sizing. This screen has 2½-in. openings on the upper deck and 1¼-in. openings on the bottom deck. Oversize goes by gravity back to the oversize bin for recrushing. The material retained on the bottom deck (1¼-in. to 2½-in.) goes through a chute to bin No. 7 of the four crushed-gravel bins below this plant.

Track shifter used about the plant and yards.

The material passing through the bottom deck of the screen goes to a 4-ft. by 8-ft. Niagara single-deck vibrating screen provided with .206-in. openings. The fines and water from this screen are

flumed to the 8-ft. sand-classifier in the sand plant. The dewatered material (.206 in. to 1¼-in.) retained on this screen is carried on a 24-in. belt-conveyor, operating on 48-ft. centers, to the first of two 4-ft. by 8-ft. Niagara single-deck vibrating screens working in series. These have ¾-in. and 5/16-in. openings respectively and the three sizes

Close view showing drive of one of classifiers.

produced are chuted to storage-bins below. These screen openings are changed when necessary to meet the market requirements.

The four concrete crushed-material storage-bins have a capacity of 250 tons each. They discharge on a 30-in. perforated loading belt, where the material is washed before loading to railroad cars for shipping or stock-piling. Either segregated aggregates or blended sizes may be obtained.

Water-Supply.—The water used for final washing and other purposes is obtained from an 18-in. well 500 ft. deep at the rate of 2,000 gal. per min. by a Bradford Mfg. Co. Size 16B deep-well turbine pump driven at the rate of 1,750 r.p.m. by a direct-connected 200-hp. U. S. electric motor. The well was dug by the Western Well Drilling Co. This water is used on the screen and classifier sprays for final washing. For preliminary washing the water from these screens and classifiers is pumped by a 4-in. Wilfley centrifugal pump to the top of the plant. From there it flows to the sand-washer and then to the bowl classifiers and to waste. The pump-house and switch-house are both located alongside the plant.

The water and fines from the washing screens and loading belt at the surge bins go to a concrete hopper below the bins. A 48-in. concrete pipe carries this waste to the concrete conveyor pit below the main silos. The sand-bins and sand-loading track are connected by 30-in. pipes to the main pipe. The material is dewatered below the silos and discharged to the second flight of the main conveyor

Locomotive crane unloading from cars to stock-piles.

(No. 1B) to the top of the gravel-screening plant, joining the main flow of material from the pit. Waste and fines from other parts of the plant are handled in the same manner.

The water is collected in a sump and handled to the primary screen or to waste by an automatically-controlled Wilfrey 4-in. pump. A similar pump drains the primary feeder below the receiving hopper. This supply of water is a closed-circuit which is replenished from plant drippage. A 150-ft. Dorr thickener will later be installed for desilting this water so that it can also be used for loading.

Gravel-loading bins showing screens and shuttle conveyor.

Shuttle conveyor under crushed-rock bins loading to railroad car.

The material sent to the stock-piles is stored and reclaimed by an Industrial Brownhoist locomotive crane powered with an Atlas-Imperial Diesel engine. All yard switching is done with a 30-ton Plymouth gasoline locomotive. A small machine-shop is used for repair work. Two Lincoln "Stable Arc" electric welders are kept in the switch-house alongside the primary crusher.

Control Features.—Group remote-control is a feature of this plant and all plant operations are controlled from two master control-stations. One of these controls the conveying, washing and classifying equipment and the other the blending, final washing, and shipping of the product. Each system is chain-interlocked so that any motor stoppage automatically stops all motors ahead of it in the flow. The control of all operations at each end by one man also eliminates costly delays and provides immediate correction of any trouble.

The first of these groups is called the "charging" end of the plant and its central control-station is located at the top of the gravel plant. This station, which is surmounted by a flagpole, gives an excellent view of all the charging-plant machinery. The conveyor framework and headhouse are of open construction to give the best visibility.

Twelve start-and-stop push-buttons are assembled on one panel in this station to control individual motors or groups of motors. When putting the plant into operation the pit feeders, elevating conveyors and scalping screen are first individually started. The washing and classifying machinery and the short transfer conveyors, because of their small motor sizes and coördinated service, are started from a single push-button. This energizes the operating coil of a multi-finger relay, each finger of which actuates the closing circuit of three or more magnetic motor-starters. These fingers close in sequence with adjustable time intervals. In designing this relay the aim was to limit the starting current for each finger to the equivalent of a single 30-hp. motor. The primary crusher is locally controlled.

As previously stated, the 21 motors in the charging end are coördinated so that any single motor stoppage stops them all. This was made possible by the interlocking of all motor controls. Special control transfer switches at the magnetic starter of each motor allow conversion to local push-button control for quick segregation in case of trouble and for carrying out routine tests. Each motor is also protected against low voltage and overload. The oversize feeder and conveyors are also controlled from this station and the recrusher is locally controlled.

The discharging end of the plant has a master control-station on the top of the shipping bins. The six gate motors and four conveyor motors are interlocked and equipped with control transfer switches similar to those in the charging station. The sump pumps and other detached and intermittent operations are locally controlled.

With this high-speed control system it is not necessary to start any motors until a few minutes before starting time as the plant goes into full production immediately. No energy is wasted in the unnecessary running of idle motors, and the complete interlock has resulted in an elimination of jams.

Electric power for the plant is furnished by the Pacific Gas I Electric Co. at 440 v. from transformers on the property. Five switchboards which distribute the current to the various motors are located approximately at the mass centers of the various motor groups. The resultant grouping of motor starters facilitates the location of trouble. The total connected load of the entire plant, including the electric shovel, is 1,161 hp. In actual operation the maximum demand, with all parts of the plant in full operation, is 891 hp.

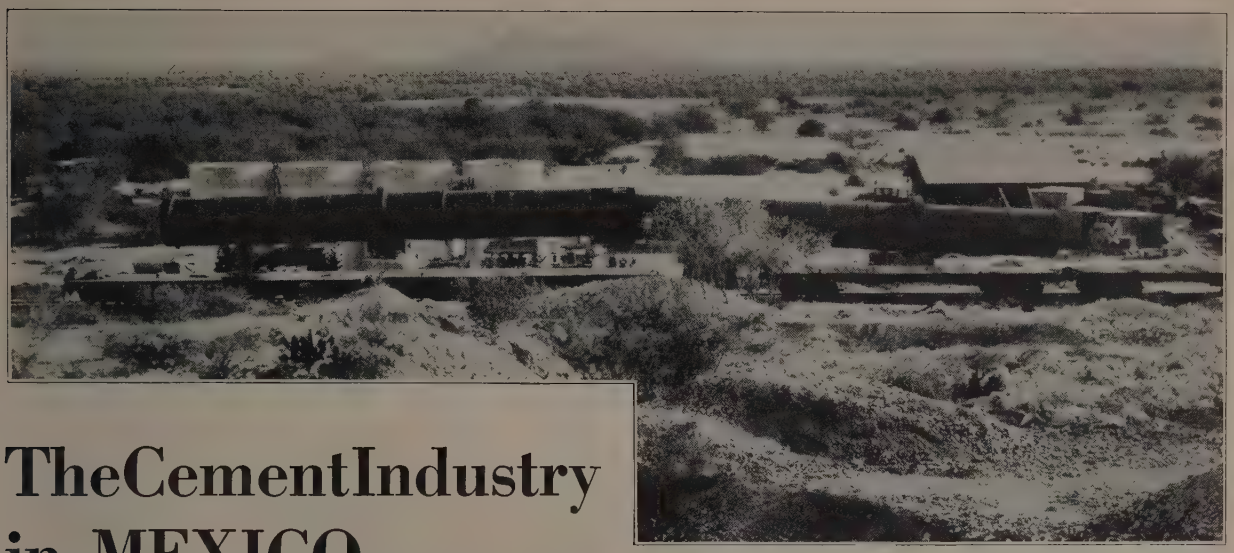
The plant was designed and built under the supervision of Thos. M. Price, material production manager and chief engineer of the Kaiser Paving Co., and H. J. Kaiser, president of the company, who also takes an active part in the material-production department. Mr. Price also designed and is in charge of the construction and operation of the new aggregate plant which will furnish over 7,000,000 cu.yd. of concrete for the Hoover Dam and its appurtenant works. This plant is being built by Six Companies, Inc., in which the Kaiser Paving Co. has an interest. Mr. Price has devoted practically all his time, since his graduation from college in 1915, to the design, construction and operation of gravel and rock screening, washing and crushing plants as well as paving plants.

L. H. Nishkian, consulting structural engineer, San Francisco, Cal., designed and supervised the construction of all structural features of the plant. The structural steel as furnished by the Western Iron Works and the concrete work was done by Schuler & McDonald. L. F. Leury, consulting electrical engineer, San Francisco, designed and supervised the electrical features. The electric operating board and equipment were furnished by the Drendell Electric Mfg. Co. and the installation and wiring were done by the Pacific Electric Motor Co. Conduit is of Crouse-Hinds Manufacture. Floodlights are used for night operation.

With a few exceptions the conveyor idlers and drives were furnished by the Bodinson Mfg. Co. and the conveyors are driven by Sterling electric motors through Pacific Gear Co. speed-reducers. The two field conveyors have Link-Belt idlers, the 48-in. loading conveyor has Stearns idlers, and Robins catenary idlers are used on the main conveyor to the top of the plant to insure perfect belt alignment. The 36-in. pit conveyor is driven by a Fairbanks-Morse motor. All the larger conveyors have tandem drives at convenient intermediate points between the head and tail pulleys. The two reclaiming conveyors under the main silos are driven through Cleveland worm-gear speed-reducers.

All the vibrating screens and the washers and classifiers are driven through Texrope and Gates drives. The Robins Gyrex and Symons screens have U. S. motors and the Niagara screens Fairbanks-Morse motors. Inclosed weatherproof motors are used throughout because of the open nature

(*Continued on page 53*)



The Cement Industry in MEXICO

A year ago the Hermosilla plant of Cemento Portland Nacional was in this stage of construction. It is now completed and in operation.

PRESENT opportunities for the sale of American cement in Mexico are in general not considered particularly significant. In recent years Mexican firms have observed the extent of natural domestic markets, and have constructed plants where reasonable outlets became evident, producing cements which, except in a very few cases, suffer little by comparison with imported cements. In addition, the domestic industry is protected by natural topographic features on both coasts, and by a substantial tariff.

However, there are certain areas along the coasts to which imported cement penetrates. The basis of competition is chiefly one of price, since nearly all the cements in international trade are of sufficiently high quality for most purposes. With the basic c. i. f. price made up of manufacturing cost and transportation charges, United States participation must necessarily depend on the advantage of a freight differential when one exists. The consumption in all the areas is limited by inland topography, comparatively small population, and the moderate extent of industrial enterprise.

With one exception, special cements are not manufactured in Mexico, but American shippers of these grades meet some competition there from other foreign producers. Considering the country as a whole, however, this demand is greatly limited, and the relatively high price of special grades is an expected obstacle to increased consumption.

In order that the potential exporter may be made aware of the flow of imported cement and the nature and extent of the domestic industry, Mexico will be considered by natural marketing divisions: the plateau section, in which many of the domestic plants are located; the northern region, bordering on the United States; the Pacific plain, accessible from western United States and the Atlantic coastal region, including the Yucatan peninsula. National consumption has more than doubled since 1922, and domestic production has increased at about the same rate, remaining about equal to 85 per cent. of consumption. The approximate annual consumption of cement, all classifications, in Mexico in recent years has been 1,551,270 bbl. or 0.0945 bbl. per capita.

Although Mexico is on the margin of the tropics, only the lowlands, or about one-fourth of the area, are tropical, and the plateau which covers the remaining three-fourths of the country has a temperate climate. This land lies between two great mountain chains, the eastern and western Sierra Madre ranges, which follow the Gulf of Mexico and Pacific coasts, respectively, leaving only narrow, hot coastal strips between the mountains and the sea. Two fairly distinct plateaus also lie in the southeast—the broken Mesa del Sur in the states of Oaxaca and Guerrero, and the Chiapas highlands, which are continued at a higher elevation in Guatemala. On the Pacific side the mountains slope directly to the sea, so the lowlands are restricted to some of the larger river valleys.

The City of Mexico is on the plateau in the temperate zone of the country, where the majority of the population lives. Preliminary census returns on the entire country for 1930 show a population of 16,404,030, an increase of 2,000,000 over the 1921 census. The racial distribution in 1921 was 30 per cent. pure Indian, 60 per cent. mixed white and Indian, and 9 per cent. white, the remainder being foreign-born or unknown. The majority of the population lives in a primitive manner and is not able to buy imported goods.

Manufacturers.—At present, seven cement plants are in operation or under construction in Mexico, as follows:

"La Tolteca," Compania de Cemento Portland, S.A. Offices: Av. Independencia 8, Mexico, D. F. Plant at Tolteca, Hidalgo. Capacity 100,000 metric tons a year.

"La Cruz Azul," Compania Manufacturera de

Cemento Portland, S.A. Offices: Av. Isabel la Catolica, 59, Mexico, D. F. Plant at Jasso, Hidalgo. Capacity 84,000 tons.

Compania de Cemento Portland "Landa," S. en C., Av. Reforma 703, Puebla, Pue. Capacity 40,000 tons.

Cementos Portland "Monterrey," S.A., Padre Mier 336, Monterrey, N. L. Capacity 85,000 tons.

Cementos "Hidalgo," S.A., Hidalgo, Nuevo Leon. Capacity 85,000 tons.

Cemento Portland "Nacional," S.A., Villa de Seris, Hermosillo, Sonora. Capacity 30,000 tons.

"La Tolteca," Compania de Cemento Portland, S.A. Plant No. 2, to be located in Mixcoac, Mexico, D. F. Capacity 60,000 tons.

Plants in operation in the spring of 1931 had a total annual capacity of 2,310,000 bbl. "Nacional" and "Tolteca No. 2" will add 525,000 bbl. to this total. Tolteca No. 2 is not expected to begin production before January, 1932.

Average daily production of the individual plants listed is unknown, but official Mexican records place total production of the first five during recent years at 894,225 bbl. in 1927, 1,265,452 in 1928, and 1,317,815 in 1929. The local cement industry estimates 1930 production at 1,250,000 bbl. It would appear that the five active plants operated at about 57 per cent. of their capacity in 1930.

"La Tolteca" Compania de Cementos Portland, S.A., in addition to the plant which it now has under construction in Mixcoac, Mexico, D. F., has just acquired control of "La Cruz Azul" Compania Manufacturera de Cemento Portland, S.A., with its plant at Jasso, Hidalgo. "La Tolteca" is British-controlled, through the Associated Portland Cement Manufacturers of Great Britain, (Ltd.). By acquiring the "Cruz Azul" plant, "Tolteca" has eliminated all domestic competition in the central section of the country, excepting the relatively small "Landa" plant in Puebla. The "Landa" plant, with an estimated production of 30,000 tons during 1930, is American-Mexican owned.

The Cementos Portland "Monterrey," S. A., with its plant in Monterrey, and the Cementos "Hidalgo," S. A., of Hidalgo, N. L., have recently combined under the name of "Cementos Mexicanos, S. A." with head offices at Monterrey, N. L. These firms are Mexican-owned.

Cemento Portland "Nacional," S. A., whose plant is now in operation at Villa de Seris, Hermosillo, Sonora, is a Mexican-controlled firm.

None of the plants listed have government affiliations. The territories served by the individual producers depend chiefly on shipping facilities and rates. In general, it may be stated that the "Monterrey" and "Hidalgo" plants serve all the northern half of the republic, excepting the states of Sonora, Sinaloa, and Baja California, with which there is no direct rail communication. The plants in the neighborhood of Mexico City, that is, "Tolteca," "Cruz Azul" and "Landa," supply the southern half of the country, with the partial exception of the Yucatan district. Yucatan, like Baja California, is isolated from the remainder of Mexico, and in general possesses better shipping connections with New Orleans than with the central regions of Mexico.

Practically the entire output of the local cement industry is confined to Portland cement conforming to United States specifications. The Monterrey plant is said to manufacture small quantities of white cement, and attempts have been made by Tolteca to manufacture this type. There are no plants engaged exclusively in the grinding of clinker, nor are such plants contemplated.

The dry process of manufacturing Portland cement is reported to be employed in all the Mexican plants except the Nacional at Villa de Seris, where the wet process is used. Fuel oil from the Mexican fields is employed in the local cement plants except in the Monterrey plant, which uses natural gas piped from Texas, and the new Nacional plant, which uses California fuel oil.

Kinds of Containers Preferred.—Cotton and jute bags are customarily used as containers by the Mexican industry, these bags being paper-lined in the case of shipments to damp tropical parts of the country. It is understood that one of the largest Mexican producers has made arrangements with a local paper manufacturer whereby it is soon to be supplied with paper bags, in which at least a part of its output will be packed. The local manufacturers usually pack their cement in bags of 50 kilograms in weight, but bags of 43 kilograms are sold by some plants. Certain of the local plants allow 15 or 20 centavos each for bags returned to the factory. However, in view of the fact that the cotton and jute bags have considerable demand among the poor for use in garments, purchasers of cement can usually dispose of them at higher prices than are allowed by the factories.

It is understood that prices of the Monterrey product are about 38 pesos per metric ton, f. o. b. plants in Monterrey or Hidalgo. Prices quoted by the Tolteca plant Mar. 10, 1931, were approximately 33 pesos per ton, f. o. b. Tolteca. Retail prices of domestic cement vary widely in different sections of the country, depending chiefly on shipping costs. In March, 1931, quotations in Mexico City varied from 30 to 40 pesos per ton.

Prices.—The Mexican cement industry is fostered by a high protective tariff. Since Jan. 1, 1930, a duty of 2 centavos per gross kilograms, or approximately $1.70 a bbl., has been assessed on imported cement. To the basic import duty should be added the usual surtax of 3 per cent. of duty.

The local cement plants sell in bulk to large consumers, or on a wholesale basis to distributors about the country. The data in Table I, supplied by

TABLE I. CEMENT PRODUCTION DATA

	1927	1928	1929
Number of factories	5	5	5
Capital invested	$4,603,490	$4,707,639	$4,808,142
Workers employed	1,187	1,430	1,469
Wages paid	$674,587	$720,401	$739,467
Weight of raw materials, *metric tons*	259,328	305,495	.....
Value of raw materials	$181,030	$220,578	$323,590
Products manufactured, *bbl.*	894,225	1,265,452	1,317,815
Products sold, *bbl.*	928,259	1,229,893	.....
Value of products sold	$2,992,387	$3,903,236	$3,992,207

TABLE II. IMPORTS OF CEMENT INTO MEXICO (*bbl.*).

Source	1924	1925	1926	1928	1929
Belgium	4,450	5,523	3,747	4,753	7,138
France	1,178	756	1,178	949	1,563
Germany	5,048	17,033	10,759	3,608	7,020
Great Britain	.....	287	2,439	9,641	24,186
Netherlands	.....	.....	.....	1	529
Italy	.....	.....	.....	730	159
Yugoslavia	.....	.....	.....	5,415	.....
Sweden	1,420	.....	.....	6,487	.....
United States	107,039	118,486	119,872	97,256	192,446
Other countries	2,351	176	961	402	414
Totals	121,486	142,261	138,956	129,242	233,455

Note: Statistics for 1927 are not available.

the National Statistical Dept., show the status of the Mexican industry in recent years:

American Cement Handicapped.—The attitude of consumers toward American cement in the parts of the country in which it has been marketed during recent years is favorable. However, the combination of a high tariff and high inland freight rates militates against its sale in the main consuming areas, notably the Mexico City area. At present the import trade in cement appears to be almost entirely confined to Baja California, Sonora, Sinaloa, and the Yucatan district, and the Nacional plant at Villa de Seris will doubtless be in a position to control the market in Sonora and Sinaloa, as well as the east coast of Baja California. Guaymas and Mazatlan are the receiving ports for the cement which is now imported into the states of Sonora and Sinaloa. Certain of the gulf ports, notably Tampico and Vera Cruz, formerly imported considerable quantities of foreign cement but, under the present tariff, their receipts are small, limited to consignments for sections where the high duty is offset by the cost of rail shipment of domestic cement from the plants in the Monterrey and Mexico City districts.

Statistics covering importation of "lime and cement" into Mexico during recent years, supplied by the Statistical Dept. of the Mexican Government, are given in Table II.

Market for White Cement.—It is estimated by the local trade that approximately 2,000 tons of white cement is imported annually, the major part of which is supplied by one American firm. This type of cement has not been manufactured successfully in Mexico, although small quantities of more or less inferior grade are being turned out at present by the Monterrey plant. White cement is used in the local tile industry and for facing in residential structures. It is usually imported in barrels of 376 lb., but some is imported in paper-lined bags. White cement is reported to sell at approximately 30 pesos per bbl. c. i. f. warehouse Mexico City.

Labeling.—There appear to be no requirements concerning labeling of foreign cement, but in view of the satisfactory reputation which American cement has enjoyed in the sections where it has been able to compete, it is advisable that it should be so labelled.

Shipping Charges.—Handling charges at the ports of entry vary widely. Inland freight charges are very high and, in addition to the heavy duty, have been an important factor militating against the importation of cement. One informant reports that the shipping charges on cement from the port of Vera Cruz to Mexico City would amount to approximately 24 pesos per metric ton. With cement from the near Tolteca plant selling at wholesale in Mexico City at about 35 pesos in March, 1931, the impossibility of bringing imported Portland cement into the Mexico City district is obvious, although with recent changes in American cement export prices and shipping rates this situation has been somewhat changed.

Uses for Cement.—Mexico City and Monterrey represent the most important markets for cement for construction purposes, although cement is widely used for the better type buildings in almost all parts of the country. In spite of the general economic depression, there is a considerable amount of building going on in each of these cities. Public-works projects, notably those being carried on by the Highway Commission and the Irrigation Commission, also provide a considerable market for cement, and there may be an opening for sales in connection with a concession recently granted for construction of a 45-mi. railroad from Chiltepec to the interior of the state of Tabasco. The demand in the mining industry, formerly a large consumer, has declined as a result of the depression in that industry.

Raw Material Supplies.—Authoritative data concerning domestic deposits of material suitable for the manufacture of cement are not available, but such deposits are said to be widespread in the central plateau area. Crude oil for fuel can be made cheaply available near the Tampico and Tehuantepec oil fields, and coal is produced in the Sabinas district. It appears probable that transportation for raw material and finished products would prove larger problems than obtaining fuel, if it were desired to extend domestic manufacture of cement to new sections.

North Central Section.—The north central region of Mexico draws the bulk of its cement supplies from plants at Monterrey and Hidalgo. Retail firms in the consuming centers carry small stocks and fill small orders; they sometimes receive commissions on large orders placed directly with the manufacturers. As elsewhere in Mexico, general opinion favors American cement, which could probably compete successfully with the domestic product at the same price, or even if slightly higher. Local dealers, however, are inclined to expect that the Mexican cement tariff will be raised, reducing still more the chances of American competition.

The mining industry takes by far the largest amount of cement consumed in this area. At present little development work is being done at the mines and the demand for cement has decreased. A considerable increase in consumption is expected to accompany an improvement in mining conditions.

No important public construction is contemplated at present in Saltillo (except motor highways, which require cement for bridges and culverts only), but cement consumption increases in that district every year. Durango used a quantity of cement in 1930 in the construction of side-

walks under contract by a paving company, which has been working in the city of Durango for three years and has about half of the projected area still to cover. Highway construction is being delayed in the state of Durango by financial difficulties, and it seems unlikely that work will be started soon on the several dams projected in Chihuahua.

Adobe or bricks are generally used for building construction, but a larger use of cement for that purpose is now recorded in Durango. It is being increasingly used for interior floors and patio pavements, and it is expected that its consumption for walls will be greater when laborers' wages are increased, since wages form the principal cost item in adobe and stone construction.

The possibility of establishing a cement plant in the vicinity of Pedricena, Durango, on the Durango-Terreon railroad, has been considered at various times. It is understood that suitable deposits of limestone exist in that vicinity, and there are also reports of coal deposits which may develop commercial possibilities. Raw materials for cement manufacture are not known to exist elsewhere in this general area.

Pacific Coast Demand.—While the Pacific section of Mexico receives much of its cement from the domestic "Tolteca" plant, it is also the only part which imports any considerable quantity. American and Japanese cements are delivered at Pacific ports, and the Ensenada district uses American cement exclusively. However, imports may be reduced now that the new cement factory at Hermosillo, Sonora, is operating. This plant is expected to operate at capacity and to serve the entire west coast of the republic, which has had no local cement manufacture before. As it is near a railroad and close to extensive deposits of limestone, the company will probably be able to offer its product at prices considerably below those for imported cements.

Owing to the heat and humidity along the southern Pacific coast, dealers can not carry large stocks of cement, which is handled on a small-profit basis. This has been a disadvantage to foreign cements, which must be imported in large quantities in order to stand the import duties and handling charges. It also appears that cement stored in this climate for a long time will lose some of its strength. These conditions and the higher price are the only objections to American cement, which otherwise is as acceptable here as it is farther north.

Domestic freight rates are very high and add considerably to the prices of both Tolteca and foreign cement, the latter having the additional burden of lighterage if brought by water. At Ensenada there is a lighterage charge of 4 pesos a ton, but it is seldom imposed, most of the imports coming by rail because transfer by lighter involves so much breakage. At Guaymas handling charges of 2 pesos by rail and 4 pesos by water are imposed. Cement imported by water at Mazatlan pays 3.25 pesos for discharging and 3.75 for lighterage.

Conditions Along the Border.—Several major construction projects are under way in northern Nogales, and it is not expected that the new plant can meet the entire demand for cement at once. As the supply of limestone in the vicinity is practically inexhaustible it may be decided to increase its capacity. The only public work contemplated for the near future in southern Sonora is the construction of state highways, and they are not expected to need much cement. Local dealers do not expect any increase in cement demand for other purposes on account of the economic depression. The only important improvements at Mazatlan are the local port works, already under construction for three years or more. The contractor has been using Swedish cement imported about four years ago; upon its exhaustion he began to use Tolteca. At Ensenada there is very little demand for cement at any time, and no important construction projects are under consideration at present.

There is a deposit of limestone and marble at Modesto, 37 kilometers north of Mazatlan, which is under the control of an American who has been making efforts for more than a year to interest sufficient capital to enable him to construct a cement plant either at the deposit or at Mazatlan. So far he has been unsuccessful because of the limited use of cement in this section, the competition with domestic cement from Tolteca and the generally unsettled conditions in Mexico. The owner of this deposit claims that the supply is unlimited, that there is sufficient depth of water for anchorage for oil tankers from which fuel oil could be pumped direct from tankers into storage tanks on shore, or that oil could be brought to the station of Modesto in tank cars.

Production on the Atlantic Coast.—The bulk of the cement required in this area is produced by the factory at Monterrey. White cement, forming about 1 per cent. of the total, is brought from the United States and is used for special purposes, such as mounting machinery in sugar mills. Formerly large quantities of American, Italian, German, Swedish, Belgian, and French cements were imported, but these imports have practically ceased on account of the high duties. The Italian, Belgian, and Swedish cements were of very low grade. One dealer reports that during 1930 Russian cement was offered c. i. f. Vera Cruz for $2.50 a bbl., but no sales were made because of the duties. If American cement could be sold at the same price as the domestic product it would be generally preferred, but dealers state that there is no profit in handling it because of the taxes and inland freight rates.

No construction projects are in progress or contemplated in the near future other than the repair of government-owned buildings at Vera Cruz—the customs-house, post-office, etc.—for which the government requires the use of Mexican cement. At Tampico cement is used for buildings, as a paving base in city areas, and for cementing oil-well casings. Sales in Vera Cruz usually run to about 200 tons of cement a month, mostly for repairs and sidewalks. Owing to the renters' strike of some years ago, the general depression, and the prohibition of the acquisition of land within 50 kilometers of the coast by foreigners, there is little or no new construction being undertaken in this region.

Progress in Use of Pre-Mixed Concrete in Highway Building Reported*

Improved Type of Equipment for Transfer of Material to Subgrade Important Gain

AT the 1931 convention of the American Road Builders' Assn., held in St. Louis, Mo., the Committee on Central and Truck Mixed Concrete presented a report which consisted largely of a survey of the field as regards the use of this product in street and highway construction. The state highway departments were canvassed as well as a selected list of cities to determine whether or not the use of ready mixed concrete was permitted under their specifications and where same was not permitted they were asked to cite their principal objections to its use. Replies were received from 42 state highway departments and from 56 cities. The principal objections raised by these departments to the use of this product were as follows:

1. Segregation.
2. Damage to subgrade by hauling equipment.
3. The difficulty of the transfer of the product from hauling unit to the subgrade.
4. Lack of control.

The report of the committee this year must, due to the following conditions, take the form of a progress report. There is in progress today, throughout the entire industry, a vast amount of research and development, which may, when completed, have a far-reaching and most influential effect on the use of concrete both from a central-mixing plant and from truck-mixers.

In view of the objections set forth in the report last year the committee feels that this year it should, in its report, show what steps have been taken by the manufacturers of equipment and producers of ready-mixed concrete to overcome these objections and to state briefly what success has been reached along these lines in actual field operations.

Segregation.—While this objection was advanced by many engineers to the use of ready-mixed concrete, it is, in reality, probably the least of the four objections. The average paving engineer, located away from the larger metropolitan areas, still thinks of his experience with ready-mixed concrete as produced in 1918-1921. He thinks of it as a product arriving on the grade in a badly-segregated condition, with no uniformity as regards consistency and as an operation over which he could not exercise the proper control. Unfortunately such engineers have not been afforded the opportunity to keep themselves informed as to the very rapid developments along this line. The difficulty of segregation has been definitely overcome in the operation of an up-to-date plant. It is, of course, true that the design of the hauling equipment has, to a large degree, made possible the elimination of this undesirable feature; however, in our opinion, the largest single item in overcoming this difficulty has been the careful preparation of the concrete with particularly close attention being paid to the gradation of the aggregates and the consistency of the mix. Concrete prepared from carefully-graded aggregates, scientifically proportioned and properly mixed in either a central-mixing plant or a truck-mixer, can be hauled without segregation for a distance or length of time far in excess of the economic limit of such haul.

Damage to Subgrade.—This item is so closely allied with the transfer of the product from the hauling unit to the subgrade that they will be treated jointly in this report.

All familiar with the use of the standard paver operating on the subgrade, and charged by material trucks, have experienced difficulty with these trucks cutting up or rutting the subgrade. The difficulty encountered with hauling units is, in this respect, the same except that it may be somewhat aggravated by the additional weight of the ready-mixed concrete equipment over that of the ordinary type of material truck.

The vast difference from the old paver operations and the real difficulty develops not from the fact that the hauling equipment damages the subgrade but from the inability to correct such damage prior to the placing of the concrete. With the boom-and-bucket type of delivery from a paver there is an interval distance equal to the length of the boom in which any such irregularities can be corrected. However, with the use of the present hauling equipment for ready-mixed concrete it is difficult to overcome this undesirable feature when it is encountered. It must be remembered that on probably the vast majority of pavement yardage to be constructed, the subgrade would be of such a type as would give little or no difficulty along this line.

Not less than ten, and probably more, different designs of equipment for transferring the product from the hauling unit to the subgrade are in the process of development. The investigator for this committee has had submitted to him during the past year mechanical drawings of several types and of which his criticism was requested. In the opinion of the investigator the most serious difficulty with the majority of these designs is the cost of the equipment. Such a service will probably, through necessity, be the property of the operator of the ready-mixed plant and the design must be such as will make its use an economical function, from the standpoint of both first cost and operation. Some equipment of this type has been built and placed

* Presented at 1932 convention of American Road Builders' Assn., at Detroit.

in actual operation. The majority of it has, in the main, operated satisfactorily, but it has also evidenced the fact that further improvement is necessary. It is practically assured that another year will see such equipment developed to a highly satisfactory degree.

Lack of Control.—We come now to one of the phases of concrete mixing which, during the past year, has probably shown the greatest single advance that has been made. There is no question that, aside from the other known variables which occur in mixing a batch of concrete, the greatest of all variables is the percentage of surface moisture present in the sand and aggregates. A number of devices were developed in previous years to attempt to compensate for this surface moisture by volumetric means and, while they were extremely useful to the industry in increasing the resultant strength of concrete to a certain extent, their greatest utility may be said to lie in the fact that they definitely established and conclusively proved the contention that the strength of concrete depends on the water-cement ratio, other factors being equal.

For various causes, which need not be gone into at this time, there has been a steady tendency on the part of engineers to favor the control of the proportioning of concrete aggregates by weight rather than by volumetric or other measurements. It has long been obvious that, if accurate means could be devised for determining and compensating for the surface moisture, then it would be not only possible but quite feasible to institute weight control of the proportioning as a fixed method. A number of obstacles have, however, stood in the way of such a development. First is the fact that no known method for determining the percentage of surface moisture, which would give results in less than 6.8 to 7.0 min., could be put to practical field use. Furthermore, after such determinations had been made it was then necessary to make calculations to care for these corrections. These corrections required changes in scale settings or readings, all which were irrevocably dependent upon the personal element. Another obstacle which presented itself, and which again involved the personal element, was the dependence upon the ability, skill, and agility of the weighman.

Aside from many of the reasons publicly assigned for the objection by a number of officials to the use of ready-mixed concrete, we must be frank enough to concede the fact that undoubtedly one of the underlying mental obstacles to the full acceptance of this method was based upon the fact that an operation was being performed some distance away from the job which, if inaccurately done, rendered even the most rigid inspection at the job entirely useless. A method practically identical in operation has been in use for making hot bituminous mixes for many years and has been accepted without question.

As the tendency among engineers toward the specification of concrete by ultimate strength rather than by ingredients is rapidly growing, so is also the tendency to sell concrete by strength, and in some cases to bond themselves to furnish concrete of a given strength, growing among ready-mixed plants.

The inevitable tendency, therefore, among such plant owners has been to add an excess of cement so as to prevent rejection of the material at the end of a 28-day test, with the possibility that, if it were rejected, all concrete supplied during that 28-day interval would have to come out. The loss is, of course, incalculable, but the worst part of it is that this has raised the price per cubic yard to the owner, whether state, municipality, federal government, or private person or firm.

One need only consult any standard concrete handbook, with allowable working stresses in design as low as 40 per cent. of the ultimate strength, to realize what enormous waste can be avoided if a reduction in the factor of safety, sufficient only to raise this allowable stress by 10 per cent. and still keep complete control of the mix, can be effected.

Concrete is the one and probably the only important building material which is manufactured on the job itself; no two jobs are alike; no two sources of material are absolutely identical; no two brands of cement have exactly the same qualities. Therefore, unless the engineer can be assured of definite and complete control of a job, it means the utilization of high factors of safety which, in turn of course, increases the cost of concrete and encourages the substitution of less expensive materials.

During the past year there have been developed and placed in actual operation improvements and refinements for the control of the mix which it is believed will overcome these objections.

Improvements there will undoubtedly be—manufacturers spent millions of dollars annually in research—but it is a fact that the year 1931 has seen us launched upon an entirely new phase of concrete design and manufacture which should have a pronounced effect upon the upward curve of the concrete industry.

Briefly summarized, improved control means better design, more economical design, better concrete, and 100-per cent. inspection, all which put the concrete industry in a better position to defend itself against the inevitable encroachment of other materials where structures of equal strength can be supplied at a cost less than that of concrete.

Finally, scientifically designed batches of concrete, scientific proportioning for a water-cement ratio are being placed in the hands of responsible technical men rather than in the unsympathetic hands of people to whom expediency has meant more than accuracy.

The committee feels safe in predicting that the year 1932 will see the engineer convinced that segregation in properly-handled ready-mixed concrete has been eliminated, the difficulties with subgrade rutting and transferring of the product from the hauling unit to the subgrade rectified by mechanical equipment of proved adequacy and control of the mix, both in the central-mixing plants and truck-mixers, handled in a manner which will eliminate any doubt in the mind of the engineer as to the effectiveness of such control.

General view of Santa Cruz plant from southwest. Clinker-handling cableway and kiln building in foreground. Primary-crusher building and raw-material-storage system in left background.

Steady Improvement in Grinding Methods Aids Cement Mill's Efficiency

Novel Plan for Off-Shore Discharge of Fuel Oil Interesting Feature at California Plant

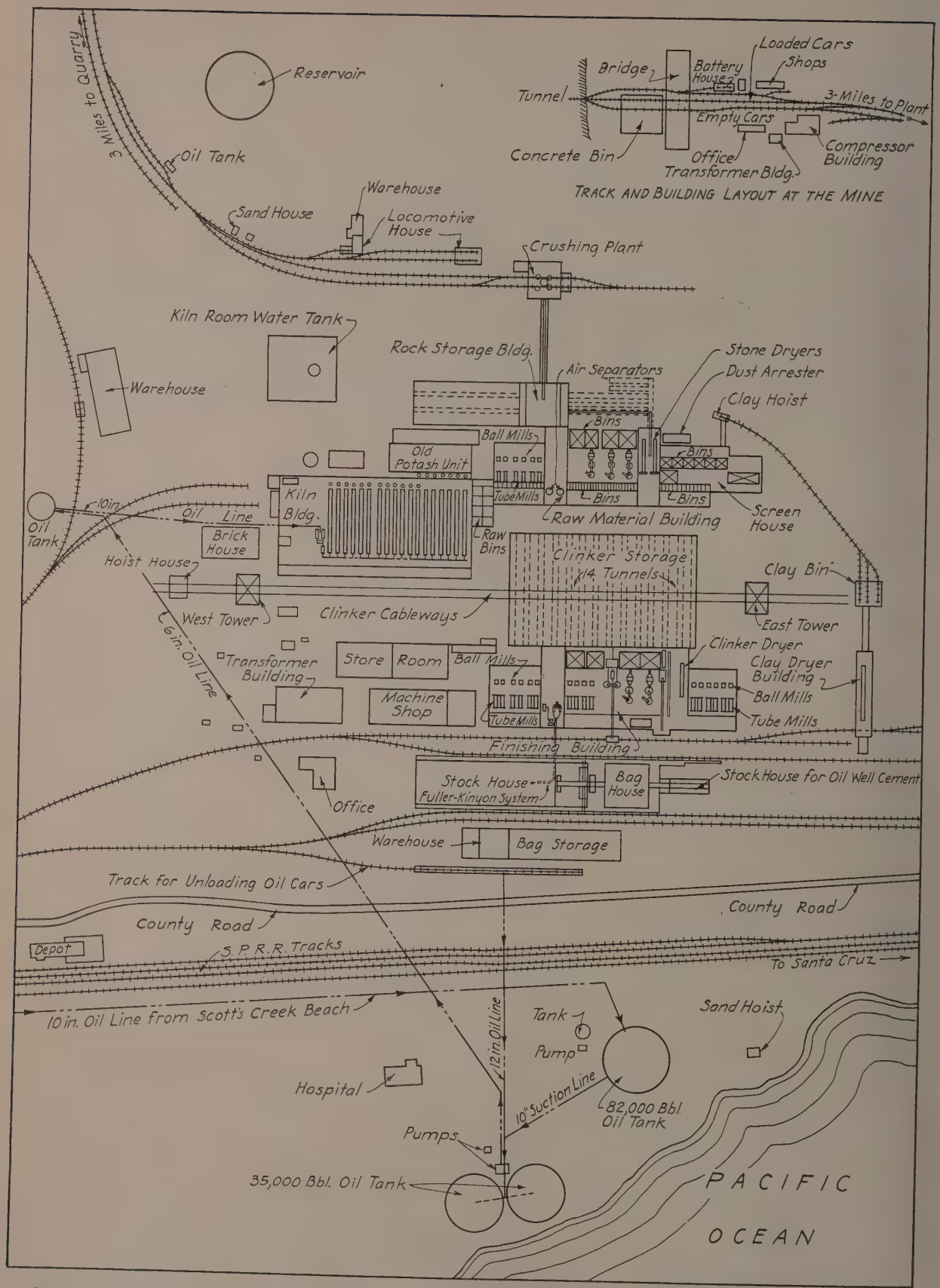
THE dry-process cement plant of the Santa Cruz Portland Cement Co. at Davenport, Cal., was one of the pioneer operations in the Far West and is one of the two largest plants on the Pacific Coast. When it was built in 1907 it had 18 kilns and a capacity of 10,000 bbl. of cement per day. Additions and improvements made from time to time have kept the plant up to modern standards of efficiency and have increased its capacity to 14,000 bbl. per day. All the original kilns are still in use, although only 12 are operated regularly.

The most important of the improvements made in the operation were begun about six years ago and gradually completed over a period of about three years. The changes made included the adoption of a glory-hole system of mining limestone in place of the open-quarry methods formerly used. Late in 1925 the small ball- and tube-mills used for finish grinding were supplemented by the installation of a 10-ft. Hardinge conical mill instead of the large tube-mills commonly used. This proved so successful that, gradually up to 1929, a total of five of these mills had been installed, three in the raw-grinding plant and two in the finish-grinding mill. Many other improvements of minor importance were also made and some of these are described in this article.

These changes have made this plant so efficient that it can now be run at its full increased capacity with fewer than 200 men, including those at the quarry. This is less than half the number required before the plant changes were made. Twenty years ago over 800 men were required to keep the plant running at capacity.

The plant is located at Davenport, which is about 13 mi. northwest of Santa Cruz, Cal. The plant is on a branch line of the Southern Pacific Ry., over which shipments are made, and is on the coastal highway leading to San Francisco. The plant site is on a slope rising gradually from a steep bluff at the edge of the Pacific Ocean, which is only a stone's throw from the plant. The side-hill location of the plant, together with the fact that limestone is brought into the plant from above, keep the material-handling costs very low. Full advantage is taken of this fact, as plant operations progress downward from the primary-crusher building to the cement-packing plant at the foot of the hill. The quarry is situated a little more than 3 mi. due north of the plant in the San Vicente Canyon in the foothills of the Santa Cruz Mountains.

As stated in the mine description, written by L. R. Davis, quarry superintendent, and to be published in a forthcoming issue, the material is loaded in the tunnels into 15-ton steel cars, which are hauled in trains of 6 or 8 to the mouth of the tunnel by three 6-ton Baldwin storage-battery locomotives. Two 18-ton Baldwin-Westinghouse electric trolley locomotives then haul the cars in trains of



Plan of the entire operation of the Santa Cruz Portland Cement Co. at Davenport, Cal. Track lay-out at mine at upper right.

20 to the plant. The 3-mi. railroad is downgrade all the way to the plant and has a maximum grade of 2 per cent. All this trackage and that at the mine is 36-in. gage.

The cars of stone on arriving at the plant are left on a siding by the locomotive and then "spotted" one at a time by means of drag cable to an electrically-operated rotary car-dumper in the primary-crusher building. The car-dumper is driven by a

The main 82,000-bbl.-capacity fuel-oil storage tank.

25-hp. Westinghouse motor through a Pacific Gear & Tool Co. Speed-reducer. The rock is discharged directly through an open hopper into the Allis-Chalmers No. 18 gyratory primary crusher, the rate of feed being controlled by the dumping speed of the car-dumper. The primary crusher is belt-driven by a 200-hp. Westinghouse motor.

The crusher has a two-way discharge which splits its product into two streams. Each of these streams is again split into two streams, each of the latter passing over a bar-grizzly with 2½-in. square openings. The grizzly oversize goes to four Allis-

Furnaces which heat fuel oil before it is fed to the kilns.

Chalmers Gates No. 6 gyratory crushers for further reduction. These are belt-driven in pairs by two 150-hp. motors. The crushing plant has sufficient capacity to supply material for a day's operation in 8 hr.

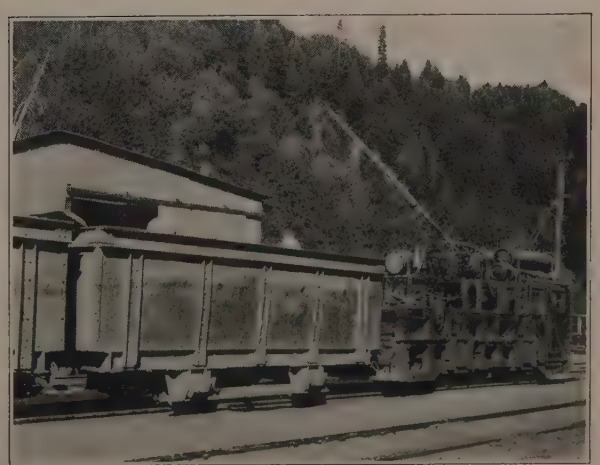
The material passing through the grizzlies and the product of the secondary crushers (minus-2½-in.) is taken by a 36-in. inclined belt-conveyor to the rock-storage building. Here the rock is screened into two sizes, the coarse having a high

A plant view from the top of the oil-storage tank. The trees along the highway break the force of storms coming in from the ocean.

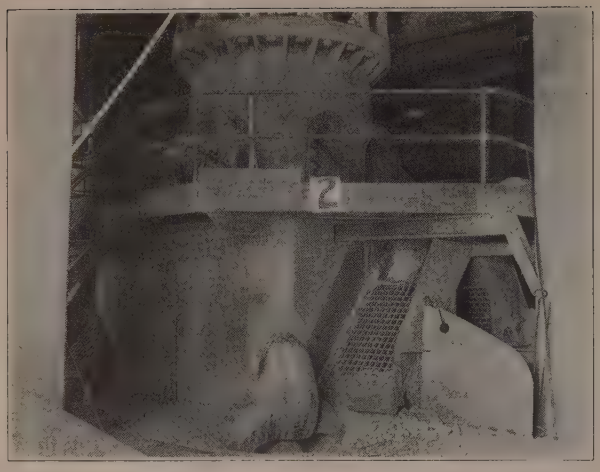
lime content and the fines, which are lower in lime but have a high clay content. These materials can be stored separately, either in the building or in stock-piles outside. The material stored in the building is reclaimed by tunnel conveyors. The stock-piled stone is handled by a Bucyrus Diesel-engine-driven crawler shovel to feeders leading to the same tunnel conveyors. Either the high- or low-lime materials can be fed back into the system in an approximate blend.

All the tunnel reclaiming conveyors discharge to a 24-in. tunnel conveyor. An Electric Controller & Mfg. Co. magnet, suspended over the discharge end of this conveyor, removes whatever tramp iron may be in the rock. The material is then discharged to a short inclined conveyor, which feeds through a feed-screw to two 7-ft. by 72-ft. rotary driers in the new raw-grinding plant. These discharge to two bucket-elevators, which feed to a pan-conveyor that runs horizontally over the tops of the reinforced-concrete rock-storage bins and discharges into them.

There are five rock bins with a capacity of 375 tons each and a clay-storage bin with a capacity of 335 tons. Stone with a high lime content is stored



Trolley locomotive and cars at mine ready to haul load of stone to plant.



Primary crusher where product is split to four grizzlies and secondary crushers.

The 7-ft. cone crusher in the raw-material-grinding building. Magnetic head-pulley above.

in three of the bins and low-lime stone in the other two. The material in each of the six bins is analyzed and a second raw blend obtained by drawing certain proportions of high- and low-lime stone and, if necessary, clay as well. Five Stephens-Adamson pan-feeders discharge to a 24-in. belt-conveyor from the stone bins. Clay is fed to the belt through a Stockton Iron Works reciprocating quadrant gate.

As the amount of clay in the limestone used in the plant is not always sufficient for a perfect mix, additional clay is shipped in from Glenwood, Cal., about 18 mi. east of the plant. This is discharged from cars to a hopper, from which it is fed to a rotary drier. A belt-conveyor feeds the dried clay to a storage-bin from which it is loaded into cars. These are hauled by a hoist to a hopper on the hill above the raw-grinding-mill building. A 24-in. belt-conveyor feeds the clay from this hopper to the clay-storage bin in that building. Because of the uniformity of the clay content in the raw material, very little use is made of the clay drier and handling equipment.

The mixing belt-conveyor has a Magnetic Mfg. Co. head-pulley to insure removal of whatever iron may remain and discharges through a short steel chute into a Symons 7-ft. cone crusher. This is set to produce a $\frac{3}{8}$-in. material and is driven by a direct-connected Westinghouse 250-hp. synchronous motor. The crusher discharges to a 30-in. inclined belt-conveyor which feeds a 125-ton concrete surge-bin alongside the roughing bins. Two parallel rows of five 4-ft. by 6-ft. Hum-mer single-deck vibrating screens below this bin are fed by roll-feeders with quadrant cut-off gates. Each row of

Car in rotary dumper discharging its load to the primary crusher.

One of the conical mills used for finish grinding.

five feeders is driven by a 5-hp. General Electric motor through a Pacific Gear & Tool Co. speed-reducer. The screens have $\frac{3}{32}$-in. wire cloth.

The oversize from the screens goes to a 30-in. inclined belt-conveyor which feeds to a 150-ton concrete surge-bin having three hoppered compartments, from which three short belt-conveyors feed through quadrant gates. These belts discharge to three 40-in. by 36-in. Allis-Chalmers double-roll reduction crushers. Each of these is set to $\frac{3}{16}$-in. and is driven by two 50-hp. Westinghouse motors through Link-Belt "Meeseco" short-center belt drives. The product of these rolls goes to the same

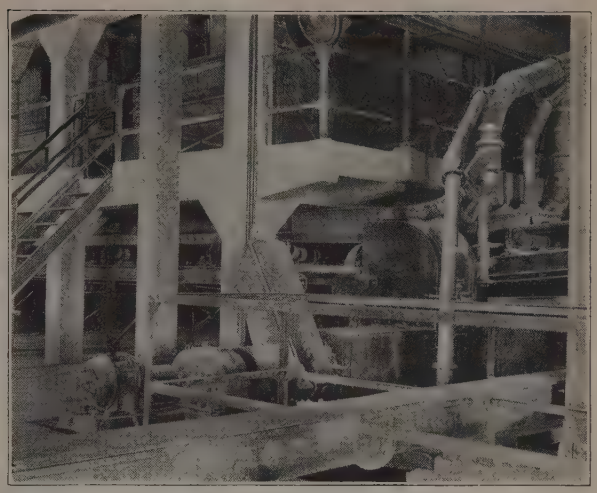
belt which takes the discharge of the cone crusher and is fed back to the vibrating screens.

The minus-7-mesh material from the vibrating screens is fed to a 24-in. inclined conveyor, which discharges to a short cross screw-conveyor where the material is automatically sampled and discharged to a 24-in. belt-conveyor operating on 480-ft. centers. This inclines to the top of a row of 40 hopper-bottomed steel bins and runs horizontally over the tops of them. Three Stephens-Adamson belt-driven trippers discharge the material to the bins. The steel bins are arranged in two groups in a single row, the first group having 12 bins and the second 28 bins. The samples taken at the screw-conveyor are immediately analyzed at a near

The weighing devices which blend the limestone before feeding to the raw-grinding mills.

chemical-control laboratory, giving the control chemist a quick and accurate knowledge of the contents of the various bins.

The mix is blended as desired from each set of bins on 24-in. reclaiming conveyors under them. Each of these two conveyors discharges a separate surge-bin at the end of each row of bins. Each of the surge-bins feeds to a 36-in. by 4-ft. 6-in. Schaffer poidometer. These two units are adjusted to feed equal amount from each bin and to discharge by chutes to the same bucket-elevator. A mixing screw-conveyor feeds to a 24-in. horizontal belt-conveyor. This in turn discharges to a 30-in. cross



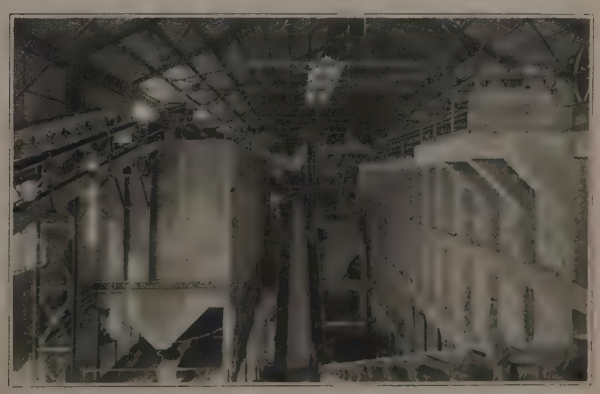
Some of the vibrating screens in the raw-grinding building with collecting belt conveyor. Return screw conveyors below and dust-collector pipes at right.

conveyor, which has three stationary trippers and runs over the tops of the Hardinge mill feed-bins.

This storage system consists of two reinforced-concrete bins, each having two compartments of 1,000-ton capacity. Three of these compartments feed from below by 18-in. belt-conveyors to the three 10-ft. by 66-in. Hardinge conical mills. Each mill is driven by a 400-hp. General Electric supersynchronous motor, the feed-conveyor motors being synchronized to vary in speed with their respective mill motors. Each mill has a No. 100 Clarage fan and a Hardinge 12-ft. superfine air-separator. The oversize from the separators goes to a 24-in. belt-conveyor, which feeds an elevator that splits its discharge to two Sturtevant air-separators, one 14 ft. and the other 16 ft. in diameter. The oversize from these is returned to the Hardinge mills by a series of 20-in. belt-conveyors.

The raw-material grinding building is unusually well protected against dust. All bucket-elevators and screw-conveyors are completely inclosed and the discharge ends of all belt-conveyors have housings over them. All points where dust is raised are connected by pipes to a series of Sly dust-collectors, which are located near the six rock and clay storage-bins and discharge their contents through a

Interior view of the raw-grinding building looking toward crushing end.



Rock and clay storage bins at right; screen-feed bin, center; and blending bins at left.

series of 6-in. and 10-in. screw-conveyors into one of the bins.

The finished raw material from the three Hardinge air-separators is chuted to a 16-in. screw-conveyor. This feeds by means of a cross chute to a 20-in. main screw-conveyor which also receives the fines from the two Sturtevant separators through short connecting screws. The main screw delivers the finished material by an elevator and a series of screw-conveyors to eight 320-ton concrete blending silos in the kiln building. Here the raw material receives its fifth and final blending. Four of these bins are filled while the other four are being

The board which controls the feed of the cement pumps to storage.

emptied. The finished raw material averages better than 90 per cent. through 200-mesh.

A screw-conveyor feeds from the blending silos to the eighteen $7\frac{1}{2}$-ft. by 7-ft. by 125-ft. kilns, more material always being fed to this screw than is required by the kilns in operation. The excess material is discharged to a surge-bin at the end of the screw-conveyor. Another screw-conveyor returns this material to the feed end of the feed conveyor. This recirculation of the material gives it an additional mixing.

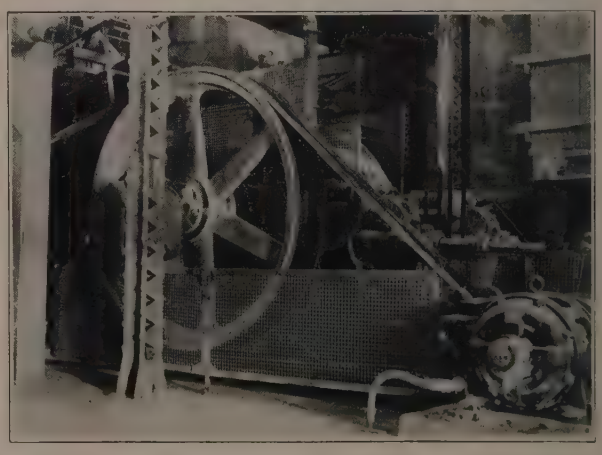
Each pair of kilns discharges to the boot of a steel-inclosed bucket-elevator inclined slightly away from the kilns. Each of these nine elevators discharges through a steel-pipe chute to a clinker storage-pile outside the kiln building. The base of the stock-pile is considerably below the kiln-floor level and the concrete foundation wall on this side of the building serves as a retaining wall for the clinker. The clinker is rehandled from this stock-pile to the main clinker-storage stock-pile by a two permanent overhead cableways spanning both storage locations. These cableways have a span of about 950 ft. and have two 2-cu.-yd. Blaw-Knox clam-shell buckets. The two towers are of steel embedded in concrete foundations and the cableways are operated by a hoist located behind the west tower and in line with them.

The main stock-pile is bounded on all sides with concrete walls and has a capacity of about 500,000 bbl. Most of this is live storage, as the clinker is recovered from storage by 14 belt-conveyors operating in parallel concrete tunnels under the stock-pile. Collecting belt-conveyors feed the clinker to a ro-

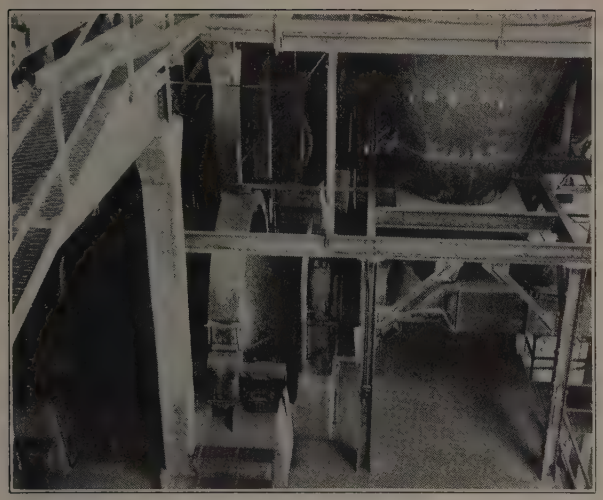
Discharge end of kilns with elevators which carry the cement to storage. Fuel-oil-heating furnaces at left.

tary drier in wet weather, although ordinarily, the clinker is fed directly to two 54-in. by 24-in. and 40-in. by 36-in. double-roll crushers operating in closed-circuit with four Hum-mer vibrating screens in a manner similar to that used in the raw-grinding building. The ground clinker and calcined

The three 40-in. by 36-in. double-roll reduction crushers in the raw-grinding building.



One of the two double-roll mills for preliminary grinding of clinker. Note magnet suspended over feed conveyor.

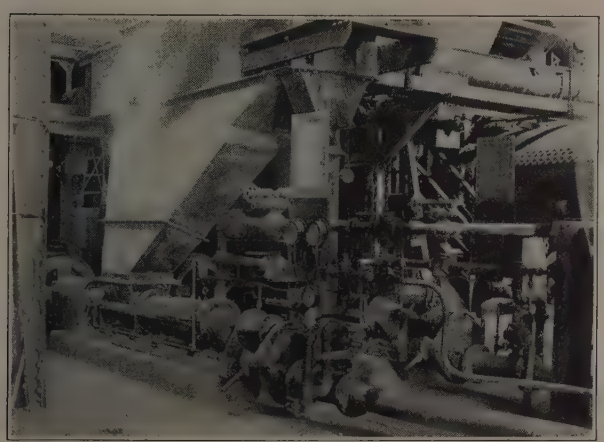


Looking down on one of the 66-in. by 10-ft. conical raw-grinding mills and its air separator.

The three conical raw-grinding mills. Limestone drier is visible in background.

ground gypsum are proportioned by Schaffer poidometers before going to the two 10-ft. by 66-in. Hardinge conical finish-grinding mills. These are similar to the ones used for raw grinding except that they have only the regulation closed-circuit air-separators that are standard with these mills.

All the cements produced are now ground in these mills, but the original ball- and tube-mills are



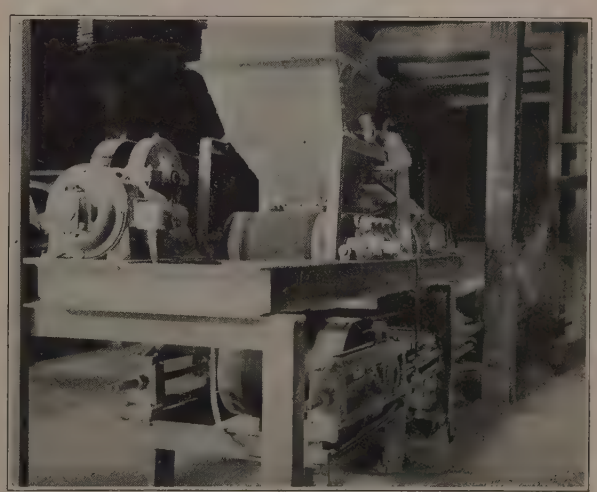
The two 6-in. pumps which handle finished cement to storage.

still in place and can be used if necessary. Of these, 6 ball- and 6 tube-mills are used exclusively for grinding oil-well cement. A Sly dust-arresting unit keeps this building clean.

The oil-well cement is handled by a 4-in. Fuller-Kinyon pump to a special stock-house of 5,000-bbl. capacity. This has its own two 3-spout Bates packers. The standard Portland cement is handled by two 6-in. Fuller-Kinyon pumps to the main stock-house. This has 20 bins, ranging from 3,000 to 12,000 bbl. in capacity, and has a total capacity of 110,000 bbl. The cement is usually sacked by four 3-spout Bates packers, but special provisions are made for loading bulk cement into cars. A Sly dust-collecting system keeps this building clean. A Fuller-Kinyon control-board in the finish-grinding building controls the cement feed to storage.

Gypsum is shipped in from Nevada and dumped from the railroad cars into a track hopper. A belt-conveyor takes the gypsum to the finish-grinding building, where it is fed from storage-tanks into a Raymond "calcining-while-grinding" mill. This consists of a standard Raymond impact pulverizer connected to a small all-fired rotary calciner. The calcined ground gypsum goes to storage, the following operations having already been described.

The oil used as fuel in this plant is received in 75,000-bbl. ships, in an unusual manner. As there is no dock or harbor in the vicinity, because of shal-

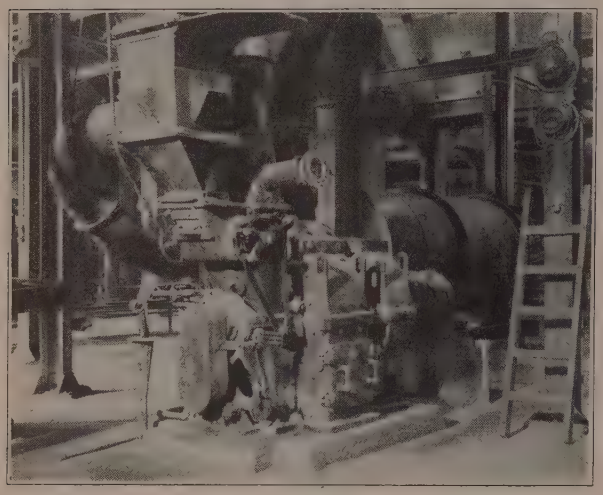


Gypsum being weighed to belt-conveyor for finish grinding.

low water and tides, the oil is unloaded from the boats while they are anchored about 3,000 ft. from shore. A pipe-line is laid for this distance on the bottom of the ocean and its location is marked by buoys. The boat is connected to a 150-ft. flexible hose at the outer end of the line and pumps the oil directly into the shore storage-tanks. The oil is first preheated to 114 deg. F. on the boats before

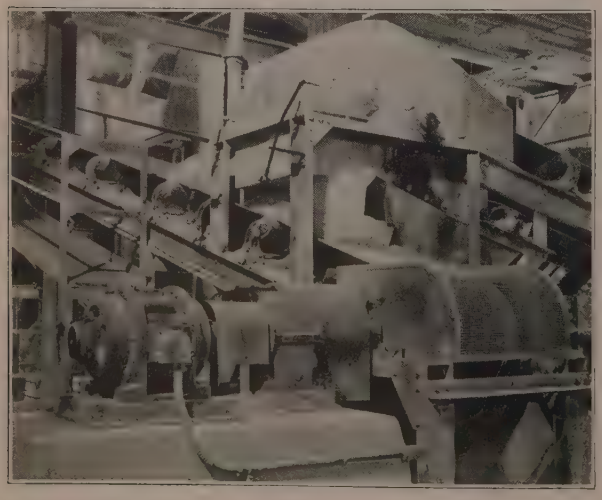
pumping in order to lower its viscosity, as a heavy 16-gravity oil, called "Bunker C," is used. Provisions are also made for removing sea water from the line at the beginning of pumping operations and for flushing out the heavy oil when finished. If this were not done, the extremely cold water at the ocean bottom would congeal the oil so that later pumping operations would be impossible.

The unloading ship pumps the oil a distance of 3,000 ft. through the pipe-line to a booster-pump station 3 mi. west of the plant. This pumps the oil the distance to the plant into an 82,000-bbl. steel storage-tank on the cliff overlooking the ocean. This was built in July, 1929, when water shipment of oil was begun. Previous to that time the oil was



The combination unit for grinding and calcining gypsum.

brought in by railway in tank-cars and discharged by gravity into two tanks which have a total capacity of 75,000 bbl. and are situated lower down on the hill. These are now used for additional storage capacity and in an emergency could still receive oil by railway. The oil is pumped from these three tanks to a 6,500-bbl. steel tank on the hill above the plant from which it is fed by gravity to the



Speed-reducer drive of belt-conveyor in raw-grinding building.

Switch and transformer room in finish-grinding building.

kiln-room. In cold weather the oil is again heated at the main storage-tanks when pumping to the 6,500-bbl. gravity tank. In the kiln building the oil is heated in special boilers before being piped to the kilns, to the stone, clay and clinker driers, and to the gypsum calciner.

Miscellaneous buildings about the plant include a substation and a transformer-house, machine and blacksmith shops, storerooms, warehouses, and locomotive and engine houses. The plant office building is an attractive one-story structure, which includes completely-equipped chemical and physical laboratories. In addition to the usual equipment the kiln-room has a small rotary kiln and tube-mill in

Display board in front of plant office on which safety record of each plant department is recorded.

which grinding and burning tests are made under actual operating conditions.

Five kinds of cement are made at the plant: standard Portland cement; regular plastic cement; water-proof plastic cement ("Plastite"); special oil-well cement; and high-silica cement.

All possible precautions are taken to insure the safety and health of the quarry and plant employees. As has been stated, the quarry has had a remarkable record since the glory-hole system was installed. The plant also has had no lost-time accidents since April, 1930. This is due to a large extent to the high type of employees attracted to this plant because of the unusually good living condi-

tions. The safety organization under Joseph Riordan is highly developed and plant first-aid teams have won many of the regional cement-plant safety contests.

The comparative records of the various departments of the plant are kept fresh in the minds of employees by an ingenious display in front of the plant office. This consists of a miniature wooden stairway with 31 steps representing the days of the month and 17 wooden effigies representing the various plant and quarry departments. The progress made up this stairway by these wooden figures shows the safety record for each department during the current month.

A very complete and attractive emergency hospital is maintained on the bluff overlooking the ocean. A doctor and nurse are in constant attendance. Here all new employees are examined before they are hired. This building has a ward, an operating room, a dental laboratory where temporary dental work is done, and a 3-room doctor's suite. Families of the employees are cared for and victims of accidents in the vicinity are also accommodated.

The new section of the raw-grinding building is of structural-steel construction with concrete foundations, floors, and bins. Some steel bins are also used, and Irving subway grating is used for stairs and walkways. All equipment in this building is driven by General Electric and Westinghouse motors, mostly through Pacific Gear & Tool Co. speed-reducers. Stephens-Adamson bucket-elevators, belt-conveyors and feeders are used throughout this building.

The flow-sheet and lay-out of this new building were made by Robert A. Kinzie, consulting engineer, San Francisco, in coöperation with the cement company's engineering and operating staffs. Mr. Kinzie also designed the present glory-hole system in use at the quarry and is retained to advise on further development of the deposit.

The main office of the Santa Cruz Portland Cement Co. is in the Crocker Bldg., San Francisco, Cal. The officers are: George T. Cameron, president; C. E. Green, vice-president; D. J. Murphy, vice-president; W. R. Berry, secretary and treasurer; George R. Gay, general manager; Fred Davis is general plant superintendent and Joseph Riordan his assistant; Frank Languth is plant engineer; L. R. Davis is quarry superintendent; E. W. Rice is chief chemist; and Robert A. Kinzie is chief engineer.

Model tube-mill and kiln in the testing laboratory.

Fred Davis, general superintendent, left, and E. W. Rice, chief chemist.

Kaiser Paving Co. Sets Example for West-Coast Gravel Producers

(*Continued from page 38*)

of the plant and the spray created by washing and material-handling operations.

All conveyor belting was furnished by the Pioneer Rubber Co., with the exception of the two perforated loading belts which were furnished by the American Rubber Co. The classifiers are of the duplex Door F and bowl types with the exception of the one furnished by the Bodinson Mfg. Co. The three sand pumps are of Wilfley manufacture.

The Kaiser Paving Co. is primarily in the wholesale aggregate business but has recently completed two concrete-distributing plants in Oakland and an aggregate-storage and handling plant in San Francisco. The latter serves the new concrete central-mixing plant of the Ready Mix Concrete Co. in that city. This was completely described in the January 13 issue of PIT AND QUARRY and is one of the outstanding plants in this field. All these plants get their aggregates direct by railway from the new gravel plant. The company also operates a crushed-rock plant plant at Mt. Shasta in the extreme northern part of the state.

The management of the Radum plant is somewhat unusual as it consists of a council of three superintendents: D. A. Rhoades, superintendent of operations; J. A. Mount, superintendent of shipping; and H. Eck, superintendent of maintenance and equipment. Routine matters in each department are handled individually, while general matters such as employment and purchases are decided by the council. The plant office is a neat one-story stucco building at the entrance to the plant.

Fig. 1. Plant at start of operations in 1923.

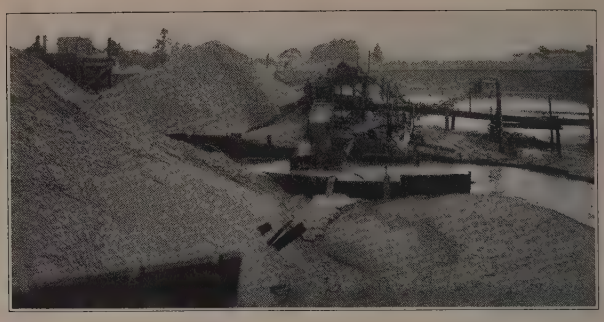


Fig. 2. Original method of screening.

Digging for Money

PART II

By JOHN J. ZOLLINGER

THERE are two distinct types of sand-and-gravel operations. The first is the type which has been perfected and enlarged through natural evolution, in keeping with its business expansion and the trend of the times. Very little ground work as a rule is done when a plant of this kind is started. As a matter of fact, thorough investigation in many instances might have precluded the building of a now successful small operation. I do not mean to convey the thought that thorough investigation is a waste of time, but the fact is that some years ago the chances of success in a small way were more favorable than they are now.

The second type of plant is the up-to-date, well-designed and well-planned operation, where the capacity is figured according to the demand and the whole undertaking is based on knowledge rather than speculation. A greater amount of capital investment naturally goes with this type, but the percentage of failures is very small, since the possibility of good management is greater than in the aforementioned type of plant.

In this article the writer will describe a plant which was started in a small way and has weathered the storm against competition for eight years. This plant was founded by David W. Newman, Avon, N. J., in 1923. Mr. Newman is well known in the business and has since been identified with several other plants. The original installation consisted of a 4-in. pump, gravity screens, hoppers, and a stiff-leg derrick. Fig. 1 shows the general layout, and Fig. 2 the simple way of screening. A tunnel efficiently handled the loading of the sand and, of course, the stiff-leg derrick distributed all the material from the screens.

A great portion of the material went for state work the first year, part of the remainder for bridge work, and the rest for local jobs. The production reached 100 tons per day, all material being sold.

Fig. 4. Plant office, scales and gasoline filling-station.

This deposit consists of 33 per cent. gravel and 66 per cent. sand. The gravel is a quartz composition and runs 100 per cent. passing a 2-in. opening. The bank is 16 ft. above water and 12 ft. below. The material is easy to wash with practically no waste.

In 1924 a 6-in. Morris pump was installed and the capacity increased to 2,000 tons per week. All the material was sold, working the plant at its maximum. The 4-in. pump previously used as a dredge pump became a unit to produce plastering or ma-

Fig. 3. Floating equipment installed in 1926.

Fig. 5. Stiff-leg derrick handling material.

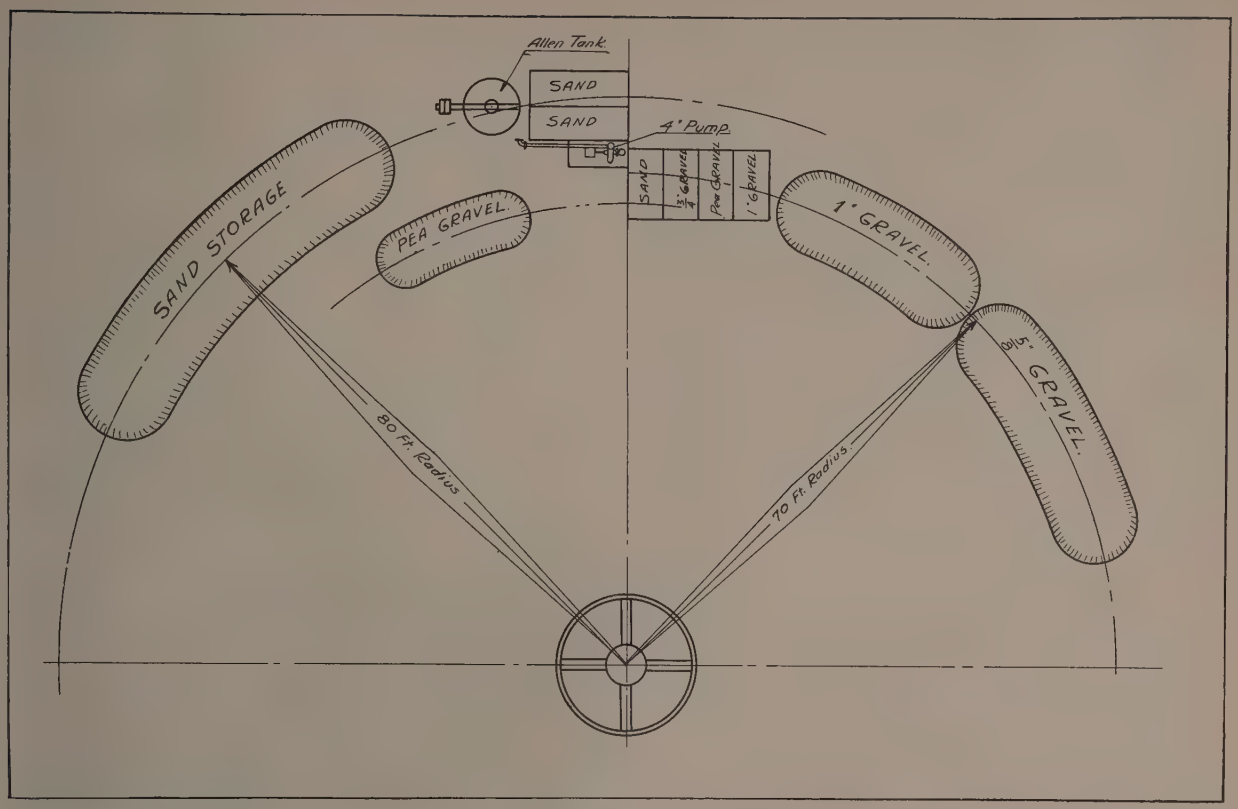


Fig. 6. The method of storage and distribution.

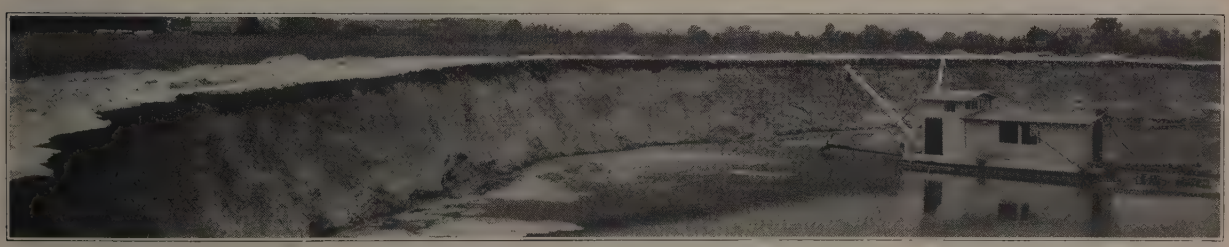


Fig. 7. The bank, showing nature of the deposit.

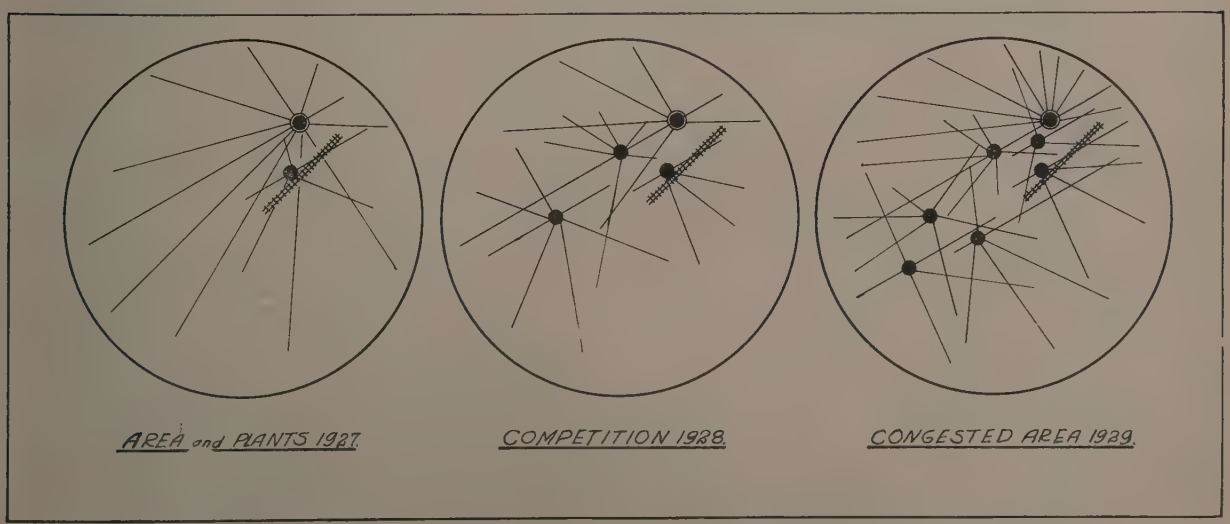


Fig. 8. Illustrating the effect of unwise competition in a limited area.

sons' sand. This installation remained unchanged for two years, during this time running at full capacity and selling all its material. I like to emphasize this fact, for the reason that specifications were lenient at that time; they had not as yet put any hardship on the producer, and the material could be disposed of as it was. Naturally, with an inexpensive plant, the production, sales efforts, and other expenses were low, and the market was open. At this time some competition was felt from another plant, which had started, but the effort of this producer was concentrated chiefly on railroad shipments.

Looking back over the three years of operation, we find that, so far, no scientific methods were necessary, a ready market existed, no surplus or waste material was left to be handled. A personnel of 4 men and one superintendent in charge of production ran the plant; the selling, etc., could be done by one man. In three years the output was tripled and still the prospects for the future looked good.

In 1926 a new barge was built and an 8-in. Morris pump installed. This resulted in a new screening lay-out, but still the stationary method remained and was adhered to until 1931. Fig. 3 shows the 8-in. barge ready for operation, with a capacity of 600 tons of salable material per day. Note the general impression of activity and the positive steps of healthy progress, also the fact that the selling expense was low and no elaborate offices were necessary to transact the business. Of course, the horseshoes shown in Fig. 4 may have had something to do with the success of this plant.

In the course of operation it was found that the plant operated in this way was not flexible enough. That is to say, the sales at the end of one month might be brought to full capacity, but, due to fluctuations, one day 100 tons might be required and the next day 800 tons. The wooden derrick with a ¾-cu.yd. bucket had fallen out of step, together with the bin and the storage capacity. An American Terry stiff-leg derrick of steel construction was installed. This carries a 90-ft. boom with a 1½-cu.yd. bucket and may be seen looming up among mountains of material in Fig. 5. In the foreground may be seen the original 4-in. pump, which is now used to repump excess sand for the production of masons' sand.

The installation of the new stiff-leg increased the shipping capacity to 1,500 tons per day, with an added bin capacity of 25 tons each. Three bin weighing-batchers were also installed to comply with state requirements for road material. It is easily seen that the plant can run at top production practically at all times, and the fluctuations of sales can be easily balanced with storage and shipping facilities. Fig. 6 will illustrate more clearly the entire system, while Fig. 7 shows the bank and the nature of the deposit.

The description of the growth of this plant has brought us up to date, as it has not been changed since 1928 and probably has reached its limit. Now, what has happened during the last four years will explain why this plant has increased to six times its original capacity in four years, and stopped growing at that point. In 1927 this one plant supplied practically 90 per cent. of the area with a little competition from the railroad plant. The year 1928 shows two additional competitors, and in 1929 we have a total of seven plants supplying the same area. (Fig. 8.) Since six of these plants are trucking and the hauls are all within practical distance, competition of this kind is felt very keenly. As a matter of fact, it occurs to me, that the foregoing development has a direct bearing on the present economic situation. If one plant can saturate a certain market within ten years, any additional plants will shorten that period and, unless new markets are provided, there is no possibility of profits when that point of saturation is reached.

I have stated that in 1927 this plant was in a position to produce 600 tons of material per day, which, over a period of ten months is approximately 150,000 tons. I have no record that the plant has produced this total, but in 1929 the tonnage was 50,384 tons for ten months with a profit of 16.5 per cent. on the investment. With a tonnage of 100,744 tons in ten months in 1928 the profit was 31.6 per cent. on the investment. From this it can readily be seen that real money is made when the plant is kept running at two-thirds capacity. The investment in this particular case is figured rather high in my estimation. But even the 16.5 per cent. is an actual good profit with production at only one-third of its peak. A plant of simple design, requiring little help to run it, able to produce a good sized output per day if required and also to run profitably on small production will withstand a good deal of competition. At the same time the product must be of high quality and, above all, service must be prompt.

The reader may be wondering about the other six plants, well, so am I. The fact is, one has been shut down for two years, another runs spasmodically, but I doubt whether any of them are making any money at all. There has been no benefit derived from the building of these plants, except by the lumber dealer and the machinery manufacturer. The industry as a borrower has lost its potentiality in this particular section and it will take a long time to bring it again into the position of prestige which our business really merits.

ACCIDENT prevention continues to play an all-important role in industry, not only from the humanitarian aspect but as a means of reducing overhead. Be sure to read "Practical Safety Methods Applied to the Sand-and-Gravel Industry" beginning on page 83 in this issue.

Some Present Trends in Specifications for Crushed-Stone Aggregates*

By H. S. MATTIMORE
Engineer of Tests and Materials Investigations, Pennsylvania Department of Highways

TO realize the trend of crushed-stone and other material specifications, if a comparison is made with the present specifications on these materials and specifications enforced several years ago, it would readily be seen that the present specifications are more definite in containing explicit terms rather than the general clauses in vogue for many years. For example, it formerly was the practice in specifications for crushed stone to call for aggregates clean, sound, and free from any deleterious materials. The change in the modern practice is definitely to limit the percentage of deleterious material and, in the case of the term for cleanliness, an endeavor is made to state this in the amount of coating permissible on the stone particles.

Durability.—One of the desirable features essential in all construction is material of durable nature. Attempts are being made at present definitely to specify test requirements for the durability of aggregates. I refer to sodium-sulphate accelerated soundness tests, and the freezing and thawing tests. All constructors realize that structures exposed to the elements in northern climates, must resist freezing and thawing, and have concluded that the materials entering into different structures must be of a nature to resist these stresses. This subject of soundness and freezing and thawing tests has been well described, and my purpose in discussing them is to indicate the tendency of specification writers to adopt this as a test for the selection of durable aggregates.

Cleanliness.—It has been the practice for a number of years to specify that all concrete aggregates shall be clean and free from coating, and no details were given prior to the past several years relative to just what this indefinite clause meant, and how it should be determined whether an aggregate met such requirements. The present tendency is definitely to state the kind and percentage of coating and deleterious material permissible in crushed stone or other aggregates. For instance, one specification adopted by a national society states:

"The maximum percentage of deleterious substances shall not exceed the following values:

	Percentage by Weight
Removed by decantation	1.0
Shale	1.0
Coal	1.0
Clay lumps	0.25
Soft fragments	5.0
Other local deleterious substances	..
Total clay lumps and soft fragments	5.0

(It is recognized that under certain conditions a percentage of deleterious substances less than that shown in the table should be specified as the maximum.)"

Such definite clauses in specifications are advantageous to all persons concerned. I would consider that they are especially desirable to the producer, as they eliminate rejections based on what may be personal judgment rather than definite determinations. I believe there is no justified objection to limiting the amount of deleterious material in a crushed stone which would be used in concrete work. There may be some objections to the specific limits placed in some specifications, but this may be a problem of geographic location, in the sense that, in some sections, crushed stone and other aggregates can be quarried and prepared free of all deleterious substance, while in other locations its removal may require costly preparation.

Gradation.—In concrete aggregates there is a growing tendency to call for shipment in separate sizes. There is no doubt that this is a forward movement. It reduces segregation and provides a better opportunity to meet the requirements of designed mixes. When this practice was started some engineers required that stone, when used as a concrete aggregate, should be delivered in three separate sizes, but I believe the present tendency is to reduce this to two sizes. In the spread of gradation of stone used in concrete aggregate the delivery of three different sizes is an unnecessary requirement. It also might be a hardship on the contractor, requiring extra equipment, additional stocking space, and an increase of the length of railroad sidings. Any change of this type in the specification is an additional expense to the contractor in regard to equipment requirements. Therefore, if such a move is made, I believe sufficient notice should be given to the contractor so that he can prepare for it in the equipment requirements.

There was a tendency within the past several years to increase the amount of crushed-stone aggregate in concrete mixes. This increase was usually in the small sizes. The reason for its adoption was the economy in the cement content. Some engineers were led to believe that this was a dangerous procedure from the standpoint of durability. The Bureau of Public Roads constructed a pavement in the vicinity of Arlington, Va., for the purpose of determining the practicability of different designs in concrete mixes, one of the problems being to obtain the effect of an increase in the amount of coarse aggregate added. Among the many conclusions formulated as a result of tests on this road is the following by F. H. Jackson, senior engineer of

* Presented at the 15th annual convention, National Crushed Stone Assn., Pittsburgh, Pa.

tests of the bureau: "The workability and uniformity in strength of the concrete was decreased in proportion to the amount of coarse aggregate added." [1]

In regard to the economy obtained in the reduction of the cement content, there is a great danger of this being secured at the sacrifice of durability. In this regard, I refer to a report delivered at the December, 1931, meeting of the Highway Research Board, entitled *The Durability in Concrete as Affected by the Water-Cement Ratio.*

Standardization of Sizes.—I believe the technical division of the crushed-stone association, along with some other associations, started some good work on the standardization of sizes. There is always a possibility of standardizing aggregate sizes throughout the United States, but the essential thing to be accomplished at this time is to reduce the number of sizes produced by the larger companies shipping to several states or different communities. In fact, this standardization of sizes is a problem of vital interest to the producer. The production of many sizes of coarse aggregates is especially severe on producing plants that ship into several states or different communities requiring different sizes of aggregates for the same purpose. It is a good forward move from that standpoint, and should eventually lead to economy to the consumer.

Laboratory Screen Openings. — Attempts have been made for many years to standardize the shape of testing screen openings. I refer to the fact that some laboratories use the round openings while others use the square openings in their testing screens. If this problem had been approached in the early stage of testing, little or no difficulty would have been experienced in standardizing the shape of the openings, but the big obstacle to it at the present time is that there are many data established on both shapes of screen openings, and the users of each shape of opening think that there is considerable more to be lost in not being able to refer accurately to these past data than there would be to be gained by the adoption of standard shapes of openings. Also some organizations have a large number of testing screens in service and such a change would be expensive to them.

Bituminous-Road Construction.—Up to this time the specifications relating to concrete-road construction have been discussed, but there is a large amount of crushed stone being used in macadam-road construction. The present tendency for specifications on macadam and bituminous roads is regulated to a large extent by the importance and the cost of the road surface. In penetration and surface-treated macadam roads the quality of stone is of considerable importance. In traffic-bound and low-cost roads the quality of stone is of some importance, but not to the same extent as the quality of that material used in the higher-type macadam construction. Low-cost road surfaces, to fulfill the requirement, should be constructed with low-cost aggregates. This does not necessarily mean so much a reduction in quality as a reduction in the refinement relative to grading requirements.

[1] *Public Roads*, xii, 6, Aug., 1931, p. 180.

Traffic-Bound Road Surfaces.—A crushed-stone aggregate of maximum size of 1¼ in. to 1½ in., containing 15 to 20 per cent. of the dust of fracture, has given excellent success in traffic-bound courses. Also, a crushed-stone aggregate having the 3-in. to 4-in. maximum size and 1¼-in. minimum size had produced some excellent base-course construction and, as the same base is filled with the 1¼-in. maximum size stone containing from 10 to 20 per cent. of the dust of fracture, it gives an opportunity to use run-of-crusher material of a maximum size of from 3 in. to 4 in. No special intermediate grade is required on this base stone.

Low-Cost Bituminous Surfacing.—In the low-cost bituminous surfacing, such as oil-bound, retread, and mixed-in-place, a maximum size stone of 1¼ in. to 1½ in., with a minimum size of ⅜ in. free from dust, has given excellent results. This material requires some refinement in gradation, from the standpoint of getting the proper penetration of the bituminous material and then securing stability in the course.

It is difficult to obtain standardization in bituminous courses when different kinds of bituminous materials are used as binders. Emulsions and tars require an excess of "fines" to avoid excessive penetration, while the asphalts require a more open mix in order to secure the proper penetration. This has not always been given due consideration in the writing of specifications. The present trend is for the engineer to take cognizance of this and, in specifying the material, to give consideration to the kind of bituminous material to be used.

Revised Figures Show Attendance of 528 at Sand and Gravel Meet

Additions to the list of those in attendance at the sand-and-gravel convention, received since the Feb. 10 issue of PIT AND QUARRY went to press, increase the attendance list printed there by 39 names. As revised, the tabular summary of the attendance shows:

Producers' representatives	234
(Companies represented, 119)	
Equipment manufacturers' representatives	154
(Companies represented, 61)	
Trade-publication representatives	11
(Publications represented, 4)	
Guests	126
(Ladies present, 47)	
Association employees	3
	528

The names to be added to the list as published follow:

Battjes (Mrs. Harry N.), Grand Rapids, Mich.
Burke (Joseph E.), Ready-Mixed Concrete Co., Pittsburgh, Pa.

(Continued on page 61)

Cost-Accounting System Plays Vital Role in Determining Profit or Loss*

By WILLIAM E. HILLIARD
General Manager, New Haven Trap Rock Co.

IN any manufacturing business it is of vital importance that the management know the exact cost of the units of production. Without such knowledge, a concern can sell blindly in the open market, obtaining the best prices it can in competition with other firms, and manage perhaps to continue in business for a time; but at any time, and especially in a period of falling prices, such a firm is at a loss to know exactly at what point it can sell at a profit and exactly how much it is losing per unit if it sells below that point. Furthermore, it is necessary not simply to know the exact total cost per unit, but to know very definitely all the different factors which enter into that cost.

In the crushed-stone industry the necessity for analytical cost-accounting was not so vital some years ago when the business was being developed; but, as time went on, the industry came to the point where the best profit could be made only by obtaining a small margin of profit per ton on as large a tonnage as the plant could produce. It became more essential that each producer should know exactly the quarry cost of his material, and, of course, that he should know also the exact cost per ton for administrative and selling expenses. During recent years, as a rule, the larger concerns that produced crushed stone have had reasonably good cost-accounting systems of their own, and, in some cases, particularly good systems. Many others, however, while they were able to obtain the total cost of operations, and divide by the total production and, therefore, obtain a cost per ton which was approximately correct, did not have adequate information as to just the amount of each factor of production which went into the final cost figure. Many of the smaller producers even yet proceed more by guesswork than by exact knowledge in estimating their costs.

Manufacturers in many other industries of a more highly technical nature than the business of crushing stone learned some time ago the advantages of uniform cost-accounting systems planned especially for their industries. During the last year and a half, a Committee of the National Crushed-Stone Assn. planned and made available for the members of the association, a manual setting forth a uniform cost-accounting system. It has been the earnest hope of the committee that this manual would be adopted as widely as possible by all producers in this organization.

This system is an excellent one in itself. Any producer who uses it year after year will have the data with which to compare the details of his operation in different seasons, to present a more complete picture of all his quarry operations, which is impossible without a good cost system.

1. One of the benefits anticipated by the use of this system is the elimination of waste of labor. Fear is too often the impelling motive of the workman—fear of losing his job. To accomplish certain tasks assigned to him, he may be wasteful of his own time and energy in trying to make a good showing on the surface of things. He fears censure, if his work is not satisfactory, and expects no commendation for work well done. A good cost system helps to make it possible for the management to know definitely the results accomplished, not only by different departments, but also by different individuals, and, with this knowledge, those in authority are able to commend a foreman or a workman for his accomplishments and create in him a better appreciation of his own ability and a desire to give his employer the best he has in him. Ambition may replace fear as a compelling motive.

2. Another benefit may be the elimination of waste of material. While occasionally a workman may waste materials or supplies on account of spite or malice, that is, of course, the rare exception and not the general rule. But enormous waste in coal, oil, electric power, raw materials and supplies is occasioned by carelessness and thoughtlessness on the part of men who merely try to do things the easiest way for themselves. Many of them would at once change their ways and use all supplies and materials more economically, if they thought anyone really knew from exact records just how they used them and cared enough to commend them when they tried to use the supplies and materials economically. In some cases bonuses can be arranged to make it a financial benefit to a workman if he can do better than a certain standard of production or accomplishment which has been set up or aimed at. But even when such payments can not be readily arranged, simple praise for good work is more effective than is commonly realized.

3. Still another benefit may be the elimination of waste in use of equipment. Machinery has replaced manpower to an amazing degree in quarry operating in recent years. But such machinery, while it helps in reducing cost if properly used, can lose much of its advantage if it is not properly used. When there is too little machinery, it can be overworked and worn out without obtaining the best results. When there is too much machinery, the excess investment may become a financial burden. Furthermore, machinery naturally tends to become less valuable and effective even when it stands unused; and, of course, during a few years it is likely to suffer from obsolescence because of the invention of newer and more efficient machinery to do the same kind of work. A good cost-accounting system will furnish operating data about the machinery which a concern is using. Guided by these

* Read at 1932 Convention, National Crushed Stone Assn., Pittsburgh, Pa.

FORM "A"—COSTS FOR SMALL QUARRIES
(Per ton of product)
Year 1931, Code No. 12; production 641,608 tons; shipments 637,973 tons.

Quarry	$0.3044
Plant	.1495
Storage	.0432
Delivery (shipping)	.0330
Total cost	$0.5301

data, the management should be able to purchase new machinery for expansion or replacement more intelligently and more in accordance with the real requirements of the concern. A system of cost-accounting in itself will not, of course, produce any of these results, but it does afford the management more definite knowledge to use in trying to run the quarry and plant to the best advantage.

4. Another advantage of a uniform cost-accounting system is the possibilities of the exchange of cost data among different firms in the same business. One method is to issue blank forms based on the system in use, to be filled in and returned to a central bureau or association office. Code numbers are placed on each form when the blank forms are sent out originally by the central bureau. (See the accompanying tables.) When the forms have been filled in by the individual concerns and returned to the central bureau, the name of the individual firm does not appear on the report. That report may be used for comparison with many others, but the identity of the firm is not disclosed. The method of using code numbers helps to overcome the reluctance which certain managers might naturally otherwise feel in revealing their own private cost figures.

Under this method one manufacturer may compare his own cost analysis with a group of other concerns' reports item by item and learn that, while the cost of the different operations in his quarry seems to be pretty much in line with those of the rest of the group, some one item, such as haulage from the quarry to the mill, might be considerably higher per ton in his figures than in the figures of the other concerns, whoever they may be.

He is encouraged to look exhaustively into that one process in his quarry. It may be that, owing to some unusual features in the lay-out of his quarry, his haulage costs naturally must be greater. On the other hand, he may find that he has not kept his hauling equipment or methods up-to-date and that other quarries are benefiting by more economical methods or equipment which he, too, can install and adapt to his own financial advantage. Once again it is clear that a uniform cost-accounting system will not necessarily produce this result for him of itself. But it will afford him comparative information which he could not obtain otherwise. By acting on this information, he may have the opportunity to improve the operation of his quarry.

5. One very important possible future advantage may result if this system is quite widely used throughout our industry. The federal laws governing interstate commerce and the laws of practically all the states for governing business within their own borders are based on the principle of free and unlimited competition. Efforts have been made in the past, and more determined efforts are to be made in the near future, to have some modification effected in the laws regarding restraint of trade. Preliminary drafts of proposed bills in Congress designed to let trade groups regulate competition to some extent indicate the following aims: (1) To reorganize the Federal Trade Commission; (2) to give more definite status in law to trade-conference procedure by trade associations under the regulation of the Federal Trade Commission; and (3) to provide in the law that certain kinds of agreements by trade groups shall be lawful.

We are especially interested in this last proposal, namely, to provide in the law that certain kinds of agreements by trade groups shall be lawful. Here are some typical examples of proposed lawful agreements:

A. To make agreements to adopt uniform terms of sale in reference to discounts, credit terms, delivery charges, advertising allowances, premiums, prizes, and the like.

B. To make agreements to gather and distribute all kinds of statistics in the trade beyond what is already legal.

C. Most important of all, to make agreements to refrain from selling below the cost of the individual seller.

If this last measure should become legal in the near future, it would become necessary for any group of business men, such as stone producers, to have some comparable basis of finding their costs of production. If a uniform cost-accounting system were already in use quite generally throughout an industry and such legislation as suggested should become effective, that industry would be in a position to benefit almost immediately from the new laws. Without a uniform cost-accounting system, that industry would find it necessary to develop one and get it quite generally used in order to get the most benefit from the new laws; and it would take a long time to get a system ready and then get it established in general use.

I have just learned that there was presented in Congress only a few weeks ago by Mr. Lewis, House of Representatives Bill No. 7,448 entitled, "A bill giving the protection of the law to the worker's right to work and guaranteeing him an equal share of the employment available; forming trade associations for industries and their employees do-

FORM "B"—COSTS FOR MEDIUM TO SMALL QUARRIES
(Per ton of product)
Year 1931; Code No. 12; production 641,608 tons; shipments 637,973 tons

Quarry		
Stripping	$0.0184	
Drilling	.0458	
Blasting	.0372	
Loading	.0823	
Hauling	.0608	
Miscellaneous	.0499	
Depletion	.0100	
Total quarry cost		$0.3044
Plant		
Crushing	$	
Screening		
Conveying		
Total plant cost		.1495
Storage		
Into	$	
Out of		
Total storage cost		.0432
Delivery (shipping)		.0330
Total cost		$0.5301

ing an interstate business, in order to enable such industries to stabilize business and to provide certain benefits for their employees, to wit: (a) Life and disability insurance; (b) workmen's accident compensation; (c) workmen's pensions; (d) unemployment insurance; and imposing certain excise taxes.

Sec. 9 states that "The Federal Trade Commission ls authorized and directed to cause the corporations subject to this act, designated and classified by it under Sec. 8 of this act, and engaged in each such trade, to form a national trade association and to give distinctive names to each such association.

Sec. 6 covers stabilization of production and reads as follows: "Plans for the stabilization of production shall include:

"1. Use of standardized accounting forms, standard cost system, balance-sheet and earnings statement, which shall be prescribed by each national trade association, subject to supervision and approval of the Federal Trade Commission."

There are six other items, covering the exchange of data, annual statements, income-tax statements, reports of member corporations to the trade associations about pay-rolls and working hours, and a standard accident-compensation system. But notice that, before anything else is specified, a standard cost system for each industry is definitely demanded. On the one hand, this bill presumably will not become a law at this time, containing as it does such a complete reversal of principles from our previous laws. On the other hand, it is very likely that some of the principles embodied in this bill may become enacted into laws in the not-too-distant future.

To sum up the salient points of what we have been saying, we have the following reasons for adopting our uniform cost-accounting system:

1. Because, being a good system in itself, it will furnish valuable comparative data from year to year or month to month in a producer's own business.

2. Because it can be used to help eliminate the waste of labor.

3. Because it can be used to help eliminate the waste of material.

4. Because it can be used to help eliminate the waste of equipment.

5. Because it may be used in comparison with the results obtained by other producers who use the same method to the common advantage of all concerned.

6. Because, if such a system is already in operation in an industry, it may enable the operators in that industry to benefit more promptly and more completely from possible future modifications of our present laws regarding the restraint of trade.

FORM "C"—DETAILED COSTS FOR MEDIUM TO LARGE QUARRIES

(Per ton of product)

Year 1931; Code No. 12—Production 641,608 tons; shipments 637,973 tons.

Quarry

	Stripping	Drilling	Blasting	Loading	Hauling	Miscelan.	Depletion	Total
Operating labor	$.0125	.0216	.0055	.0363	.0140	.0285	.....	$0.1184
Operating material	.0004	.0114	.0295	.0081	.0078	.0021	.....	.0593
Repair labor	.0003	.0014	.....	.0159	.0091	.0017	.....	.0284
Repair material	.0003	.0017	.....	.0103	.0056	.0016	.....	.0195
Power	.0032	.0053	.....	.0019	.0021	.....	.....	.0125
Sundry expense	.....	.....	.....	.....	.....	.0111	.....	.0111
Overhead	.0011	.0020	.0022	.0048	.0035	.0036	.....	.0172
Charges from reserves	.0006	.0007	.....	.0050	.0006	.0013	.....	.0082
Special charges	.....	.0017	.....	.....	.0181	.....	.....	.0198
Depletion	.....	.....	.....	.....	.....	.....	.0100	.0100
Total quarry cost	$.0184	.0458	.0372	.0823	.0608	.0499	.0100	$0.3044

Plant

	Crushing	Screening	Conveying	Total
Operating labor	.....	.....	.....	$0.0241
Operating material	.....	.....	.....	.0064
Repair labor	.....	.....	.....	.0132
Repair material	.....	.....	.....	.0257
Power	.....	.....	.....	.0270
Sundry expense	.....	.....	.....	.0054
Overhead	.....	.....	.....	.0058
Charges from reserves	.....	.....	.....	.0295
Special charges	.....	.....	.....	.0124
Total plant cost	.....	.....	.....	$0.1495

Storage

	Into and out of
Operating labor	$0.0122
Operating material	.0022
Repair labor	.0033
Repair material	.0031
Power	.....
Sundry expense	.0070
Overhead	.0022
Charges from reserves	.0132
Special charges	.....
Total storage cost	$0.0432

Delivery (shipping)

Operating labor	$ .0172
Operating material	.0008
Repair labor	.0013
Repair material	.0013
Power	.0022
Sundry expense	.0002
Overhead	.0028
Charges from reserves	.0072
Special charges	.....
Total delivery cost	$0.0330
Total cost	$0.5301

Revised Attendance Figures

[(*Continued from page 58*)

Butterworth (A. C.), General Material Co., St. Louis, Mo.
Clouse (H. D.), Lincoln Sand & Gravel Co., Lincoln, Ill.
Dann (Mrs. Alexander W.), Glen Osborne, Pa.
Davia (Mrs. A.), Pittsburgh, Pa.
Davison (Mrs. Butler R.), Pittsburgh, Pa.
Davison (Mrs. George McC.), Pittsburgh, Pa.
Edwards (Mrs. V. B.), Pittsburgh, Pa.
Frosch (Mrs. A. E.), East Liverpool, O.
Fuller (L. J.), Manganese Steel Forge Co., Philadelphia, Pa.
Gemmer (Mrs. W. H.), Houston, Tex.
Griffin (G. O.), McCrady-Rodgers Co., Pittsburgh, Pa.
Grove (Robert E.), Ketchum, MacLeod & Grove, Inc., Pittsburgh, Pa. (Originally listed as Robert E. Yeone.)
Holden (Mrs. Carrie T.), Gloversville, N. Y.
Jones (W. Porter), Jones-Brady, Pittsburgh, Pa.
Kichnee (Miss Marguerite L.), Columbus, O.
Knopel (Mrs. Herbert J.), Philadelphia, Pa.
Louffer (Mrs. Paul R.), Bremen, O.
Lower (Mrs. W. J.), Mingo Jct., O.
McCrady (Mrs. Howard C.), Wilkinsburg, Pa.
McKim (Mrs. Pearl O.), Washington, D. C.
McMillin (Mrs. E. R.), Pittsburgh, Pa.
Mills (Mrs. E. E.), Massillon, O.
Moynehan (Mrs. Almeda), Johnstown, N. Y.
Neville (Mrs. C. F.), Terre Haute, Ind.
Neville (Miss Nellie), Mingo Jct., O.
O'Toole (Edward), Glacier Sand & Stone Co., Islington, Mass. (Originally listed as Edward O. Toole.)
O'Toole (Mrs. Edward), Islington, Mass.
Proudley (C. E.), National Sand & Gravel Assn., Washington, D. C.
Rodgers (Mrs. Phil K.), Pittsburgh, Pa.
Taylor (A. R.), Koppers Products Co., Pittsburgh, Pa.
Tisher (W. A.), River Sand Co., Steubenville, O.
Tisher (Mrs. W. A.), Steubenville, O.
Wagoner (Mrs. John H.), Boonville, N. Y.
Walker (Mrs. Stanton), Washington, D. C.
Warren (Mrs. Ray V.), Pittsburgh, Pa.
West (H. E.), West Sand Co., Muskogee, Okla.
Williamson (Mrs. George H.), Allison Park, Pa.
Yon (Mrs. Charles), Pittsburgh, Pa.

West Virginia Possesses Vast Reserves of Limestone and Sandstone

Enormous Nonmetallic-Mineral Resources of State Remain Relatively Undeveloped

By JAMES D. SISLER
State Geologist

MOST of the development of West Virginia's mineral resources has been in the exploitation of coal, oil, and gas. The resources which are contained in hundreds of square miles of excellent deposits of shale, limestone, sand and gravel, and clay have hardly been touched (Fig. 1). Although West Virginia is tributary to many large industrial centers, including Cincinnati, Philadelphia, Pittsburgh and other cities along the Atlantic seaboard, small quantities of natural products, such as building stone, crushed stone, and sand and gravel, have been shipped outside the state.

At present there is a great expansion of the chemical industry in West Virginia. This has resulted in much building, and in the construction of highways (Fig. 2) and railways. In 1921, through an intensive road-building program which was inaugurated in this state, all county-seats were to be connected by hard-surfaced roads. This program has been completed and another, that of hard-surfacing tributary roads, is now being carried forward. This road-building program has resulted in the use of large quantities of sandstone, limestone and shale for surfacing and aggregate.

Although only three cement plants are now working in West Virginia and the number of quarries producing limestone for flux and railroad ballast is limited, enormous areas of limestone, which is suitable for these purposes, are readily available in West Virginia.

High-grade dolomite occurs near Millville in Jefferson County, where it is quarried extensively for the manufacture of refractory, dead-burned dolomite. Several plants are preparing agricultural lime.

Nearly two-thirds of the crushed limestone of West Virginia is sold as furnace flux. Although most of this material now comes from Berkeley and Jefferson Counties, other counties, including Morgan, Monongalia, Preston, Mineral, Grant Hampshire, Hardy, Randolph, Pendleton, Pocahontas, Greenbrier, Mercer, Monroe and Summers, also produce small quantities of it. All these counties contain tremendous reserves of excellent limestone suitable for many purposes.

Geology of Pit-and-Quarry Materials.—The rocks of West Virginia are, with the exception of those in two small areas, of sedimentary origin. They are composed principally of sandstone, shale, and limestone, with numerous beds of clay and coal which occur principally in the Pennsylvanian System. Rocks of recent period are composed of alluvial material deposited by rivers and creeks. These deposits consist of clay, sand, and boulders; they usually range from a few feet to 50 ft. in thickness, and are the source of sand and gravel in West Virginia. There are no glacial deposits within the state. Another source of sand and gravel are the Pleistocene beds which lie along the principal river valleys of the state at various intervals above the present drainage levels. Some of these deposits have been washed in from glacial deposits which exist north of West Virginia. The youngest rocks of West Virginia belong to the Permian System. This system is underlain in turn by Pennsylvanian, Mississippian, Devonian, Silurian, Ordovician, Cambrian, all which outcrop at some place within the borders of West Virginia. During each of these periods sandstones and limestones were deposited. The principal outcropping sandstone beds which are used for building stone occur in western and central West Virginia in the Pennsylvanian and Mississippian Periods. In eastern West Virginia the Devonian, Silurian, Ordovician and Cambrian Periods contain not only sandstone which would make admirable building stone but many limestones which are suitable for flux, cement, crushed stone, and building stone.

Commercial Limestones

Shenandoah Limestone.—The Shenandoah limestone occurs in a belt which extends from Maryland across Jefferson County and a large part of Berkeley. Its width averages about 20 mi. The same limestone outcrops in Pendleton County for a distance of 7 mi. and has an average width of 1 mi.

The limestone varies in color from a light gray to a dark blue to black. Although the black limestone appears to be most impure, it is extremely high in calcium carbonate. The dark color is caused by organic material. The Shenandoah limestone has been opened in a number of quarries in parts of Jefferson and Berkeley Counties. It is used in the manufacture of lime, for railroad ballast, and for flux which is shipped to Pittsburgh and other steel centers.

The Shenandoah limestone has been opened in a great many small quarries for building stone and crushed stone for use on state and county highways. It is worked at Martinsburg, Engles Siding, Bakerton, Bunker Hill, and Millville. It is shipped from these quarries for flux.

Silurian Limestones. — The Silurian limestones are 500 to 600 ft. thick and outcrop through Mor-

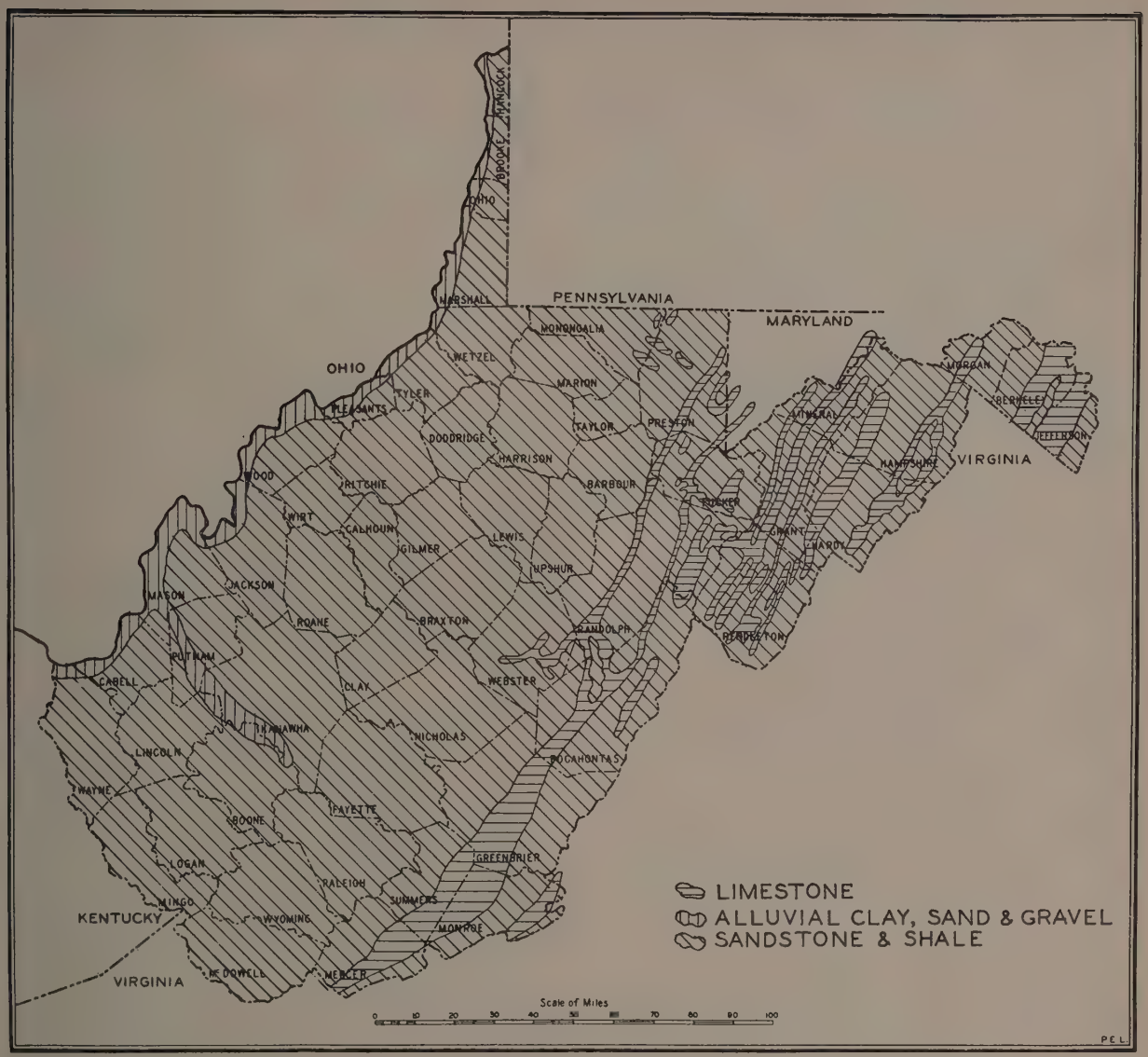


Fig. 1. Map of West Virginia showing limestone, sandstone, shale, clay, sand and gravel.

gan, Mineral, Hampshire, Hardy, Grant and Pendleton Counties (Fig. 3). They are mined at Keyser by the Standard Lime & Stone Co. (Fig. 4), principally for ballast and flux. A small quarry in this limestone occurs near the county road ½ mi. east of Keyser.

Greenbrier Limestone.—The Greenbrier has the most extensive outcrop of any limestone in the state. It enters from Pennsylvania into Monongalia and Preston Counties and has a thickness of 80 to 100 ft. It extends southwest into Tucker, Webster, Grant and Randolph Counties and widens into Pocahontas, Greenbrier, Summers, Monroe and Mercer Counties, where its thickness reaches 1,000 ft. near Union in Monroe County.

The physical character of the limestone varies in different localities, but it is usually light to dark blue in color. The limestone in a number of localities, especially near Hendricks in Tucker County (Fairfax Sand & Crushed Stone Co. at Thomas, Fig. 5), near Marlinton in Pocahontas County and in Greenbrier County, contains numerous underground water channels and caves. The Greenbrier limestone is important economically at a number of places. The union member of the Greenbrier is the most persistent and best member. It is worked at Greer, Monongalia County, for road metal and concrete aggregate. The rock is blue in color and very hard. It is also suitable for the manufacture of Portland cement. Near Hendricks the West Virginia Lime & Cement Co. has built two kilns for the manufacture of agricultural lime. At Fort Spring and Frazier large quantities of the Greenbrier are crushed for ballast. The limestone is hard and massive at these places.

Numerous other small limestones occur in the Pennsylvanian, particularly in the Conemaugh and Monongahela Series. They are worked locally for agricultural lime and road metal, but have very little economic value.

Commercial Sandstone

Sandstone has a widespread occurrence in West Virginia (Fig. 5). Most of the geologic groups, from the Gilmore sandstone in the Dunkard Series to the Lower Silurian sandstones, are suitable for

Fig. 2. West Virginia nonmetallic minerals have gone into the making of many miles of concrete roads through the scenic sections of the state.

many purposes. They have been used for building stone, crushed stone, concrete aggregate, and road metal. Grindstones have been quarried in West Virginia for many years. In the past 10 yr. pulpstones, which are used for grinding paper pulp, have been quarried at numerous locations (Fig. 6).

Gilmore Sandstone.—The Gilmore sandstone occurs in northern West Virginia and principally in Wetzel County. It has not been used commercially but is known locally. It is a massive bed of coarse, yellowish-brown sandstone 25 to 30 ft. thick.

Nineveh Sandstone. — This sandstone occurs about 200 ft. below the Silurian sandstone and is particularly prominent in Marshall, Wetzel, Monongalia, Marion, Harrison and Doddridge Counties. The rock is yellowish gray in color and has been quarried at many places for building stone, particularly along the Baltimore & Ohio Railway between Salem and Long Run in Doddridge County and also at Littleton in Wetzel County.

Fish Creek Sandstone.—This sandstone has been extensively quarried for building stone between Littleton and Burton, Wetzel County (Fig. 7), and for pulpstone near Hundred. It also occurs in various other counties in northern West Virginia, but has not been used commercially.

Marietta Sandstones.—These sandstones are locally 100 ft. or more in thickness and occur in two or three great benches. In Roane, Jackson, Mason, Calhoun, Gilmer, Wirt, Lewis and Ritchie Counties these sandstones are particularly thick and are of excellent texture for building stone. They have been quarried for many years in the vicinity of Parkersburg for building stone and grindstones.

The Marietta sandstones range from greenish gray to gray in color and, although the grain size varies considerably, they usually are fine-textured. They are composed of silica with small admixtures of alumina, iron, lime oxide, and magnesium oxide.

Waynesburg Sandstone.—This sandstone, which occurs near the base of the Dunkard Series, has been quarried more extensively than any other sandstone in the state. Its occurrence is limited to the area in which the Dunkard group occurs in northern West Virginia. It is very valuable for constructing residences, buildings, and bridge abutments. It is seldom less than 50 ft., and is locally more than 75 ft., in thickness and outcrops in Monongalia, Marion, Harrison, Lewis, Gilmer, Calhoun, Roane, Kanawha, Putnam and Cabell Counties. It leaves West Virginia in Wayne County. In the northern part of the state it tends to be fine-grained and massive, but it becomes more pebbly along its outcrop through central and southern West Virginia. In its outcrop in Ohio, Marshall, Wetzel and Tyler Counties it is occasionally massive but is rarely of commercial value. The Waynesburg sandstone is extremely high in silica. It also contains small quantities of iron, alumina and magnesium oxide.

Gilboy Sandstone.—This sandstone is very hard, fine-grained, and is grayish white in color. It seldom contains any pebbles. Quarries have been located in this sandstone in various parts of northern

Fig. 3. Silurian limestone outcrop in Pendleton County.

West Virginia, principally in Marion, Lewis and Gilmer Counties.

Uniontown Sandstone. — This sandstone, which occurs near the top of the Monongahela Series, is important particularly in Harrison and Pleasants Counties. It is a massive fine-grained sandstone containing considerable mica. The stone has been quarried for foundations, stone walls, and buildings, and some of it has been used as crushed stone.

Sewickley Sandstone.—This rock is particularly massive and important through Harrison, Lewis, and Gilmer Counties and in southwestern counties where the Monongahela Series outcrops. It has been quarried near Weston where it is a close-grained sandstone with a greenish to gray color. The color is quite permanent when used in buildings.

Upper Pittsburgh Sandstone.—This sandstone is

thick, coarse, and gray in color; it is usually soft and readily disintegrates when exposed to the weather. These characteristics are prominent along the eastern outcrop of the Pittsburgh Coal. This sandstone has been quarried to some extent in the Fairmont region. Southward through southern Lewis, eastern Gilmer and southern Braxton Counties the Upper Pittsburgh Sandstone is very massive and appears to be a good building stone but has not been used. Its outcrop continues southwestward through Braxton, Roane and Kanawha Counties and forms massive cliffs at Hartford, Point Pleasant and other towns along Ohio River.

Connellsville Sandstone. — When massive, this rock is one of the finest building stones in the Pennsylvanian Group. The sand grains are coarse and contain silica and peroxide of iron. The iron in the rock locally gives it a reddish tint and again at other localities it may be speckled and resemble gray granite. Many private and public buildings have been constructed from the Connellsville Sandstone. It is particularly desirable as a building stone because it splits readily into various sizes and shapes. The masonry effect is paritcularly pleasing. The sandstone ranges from 20 to 50 ft. in thickness and makes large cliffs along Monongahela River between Morgantown and Fairmont. It also has a conspicuous outcrop in Barbour County. It has been used for curbstone in many cities in northern West Virginia and is also shipped to Pittsburgh for that use. The Lower Connellsville sandstone is quarried extensively at and near Opekiska, Monongalia County, for pulpstone. The average chemical composition of this sandstone is as follows:

Silica and insoluble	97.19
Lime oxide	trace
Magnesium oxide	00.04
Moisture and loss	00.59

Morgantown Sandstone.—This sandstone has its best exposure in Monongalia County. It usually has a yellowish-gray color and splits into blocks very readily. In weathering the rock changes in color from a gray to a dirty brown. Large quantities of this rock were used in the construction of the state university buildings at Morgantown, and after 25 yr. of exposure to the weather some of the stone work has begun to disintegrate. Several of the locks on Monongahela River between Morgantown and Pittsburgh have been constructed of this stone and its disintegration has been a constant source of expense.

Fig. 5. Plant of the Fairfax Sand & Crushed Stone Co. at Thomas.

Usually this rock is 25 to 30 ft. in thickness, but locally it is 100 ft. in thickness. This sandstone has been quarried and used at Huntington and Gassaway. It was used in building the locks below Charleston.

Saltsburg Sandstone. — This sandstone is quite massive in the tier of counties extending from Braxton along Elk River to the Great Kanawha and beyond. It is also well developed in Brooke County

Fig. 4. Unusual limestone formations in the quarry of Standard Lime & Stone Co. at Keyser.

Fig. 6. Typical sandstone outcrop in a creek flowing between Fairmont and Grafton.

in the northern Panhandle, where it has been quarried and used for building stone. A quarry in this sandstone is at Albright, Preston County. An old quarry at Kingwood, Preston County, furnished building stone to New York, Philadelphia, and other eastern cities for many years.

Buffalo Sandstone.—This sandstone occurs near the base of the Conemaugh Series. It is usually approximately 50 ft. thick and has an extensive outcrop in Monongalia County and extends southwestward across the state. This sandstone is frequently very pebbly and occasionally it disintegrates into a bed of rounded quartz gravel. It has been quarried at Philippi in Barbour County, Grafton in Taylor County, Morgantown in Monongalia County, and at Frametown in Braxton County. It is of principal importance at Grafton, where it is usually a blue fine-grained rock with black and white mica flakes scattered through it. It is used principally for the construction of residences and other buildings.

Mahoning Sandstone.—This sandstone lies at the base of the Conemaugh Series. It is usually hard but frequently pebbly. The sand grains are cemented by peroxide of iron and silica. This sandstone splits readily into blocks of desired size and is frequently quarried for bridge masonry. This stone has been quarried at many points in the northern counties of West Virginia.

Upper Freeport Sandstone. — This is a fine-grained homogenous rock consisting almost wholly of quartz grains. It varies in color from white to greenish white to bluish green. It occurs near the top of the Allegheny Series and is quarried at Belington and Philippi in Barbour County. In the vicinity of Charleston it is extremely thick and is locally known as the Charleston sandstone (Fig. 8). This sandstone is probably a combination of various sandstones occurring at the base of the Conemaugh. This sandstone has been opened for a number of years in various places around Charleston. It is rather fine-grained, blue to gray in color, and has mica flakes through it. It breaks into blocks suitable for building purposes. It is also used for ballast and crushed stone. It was used in the construction of the locks along Kanawha River.

Lower Freeport Sandstone.—This rock is usually quite hard, micaceous, often pebbly, and does not split evenly. Locally it is a fine-grained sandstone which is suitable for building stone, pulp, and

Fig. 7. Pulpstone quarry near Littleton, Wetzel County.

grindstone. It has been mined at various places in Hancock County for these purposes.

Homewood Sandstone.—The Homewood or Roaring Creek sandstone lies at the top of the Pittsburgh Series. It is a massive, coarse and often pebbly sandstone, usually having a grayish white color. It is exposed in many parts of the state. It is quarried at various points for railroad ballast, road metal, building stone, concrete aggregate, and glass sand. Quarries are located in Monongalia, Preston, Upshur, Barbour and Mineral Counties.

Coalburg Sandstone.—This rock occurs only in

southern West Virginia in the Kanawha Series. It is one of many sandstones occurring in this series which are generally coarse and bluish gray in color. This sandstone has been extensively quarried near Charleston on Kanawha River and the product was principally used for building stone and crushed stone for concrete aggregate.

Alderson Sandstone.—This rock is usually very hard; it is red to brown in color and weathers to dark brown. It is close-grained in texture and almost quartzitic in structure. Very small grains of

Fig. 8. Savage quarry in the Charleston sandstone near Charleston.

mica occur throughout the rock. It is quarried near Alderson in Monroe County and in Manheim in Preston County. This is the only sandstone in large areas in the Mauch Chunk Series which is suitable for building stone. Other sandstones appear locally but not in large quantities.

Rowlesburg Sandstone.—This sandstone is particularly massive near Rowlesburg in Preston County, where it is a close-grained, hard sandstone with white mica flakes and very small quartz grains. It was used in the trim of Johns Hopkins University buildings at Baltimore and various other large buildings in that city. Large quantities of this stone have been shipped to Philadelphia and New York.

Oriskany Sandstone.—The most important glass-sand district in West Virginia is near Berkeley Springs in Morgan County, where the Oriskany sandstone is quarried. This sandstone outcrops on a number of ridges in both Morgan and Berkeley Counties. In many localities it is much iron-stained but in others it is a snow-white, soft sand, admirable in its physical and chemical characteristics for use in glass manufacture. Several companies are operating in this sandstone (Fig. 9).

Lower Silurian Sandstones.—The Lower Silurian sandstones are not used for building stone in this state at this time. The Medina Group of the Lower Silurian is composed of three members, White, Red, and Gray Medina. The White Medina has been quarried for glass sand in Morgan County and it also makes an excellent railroad ballast.

Shale

Shale has a widespread occurrence in West Virginia. The principal commercial shales occur in the Pennsylvanian Series. They are quarried principally in the western Panhandle of the state for the manufacture of shale brick. The larger tributaries of Ohio River have shale-brick plants located along them.

Shales are used at Huntington, Barboursville and Ona in Cabell County, Clarksburg in Harrison County, Spillman in Mason County, Moundsville in Marshall County, and Parkersburg in Wood County for the manufacture of brick. At some localities the shales contain much clay and form a natural mixture which is suitable for making common brick.

Fig. 9. Pit of the Hazle Atlas Glass Co. near Great Cacapon.

At other localities various quantities of clays are added to the shales.

Clays

The State of West Virginia is well supplied with valuable clay deposits which are found in all sections of the state and at numerous geologic horizons. Some of these deposits are used or have been used, but large areas remain untouched. The alluvial clays in the valleys are mined principally for the manufacture of brick, sewer tile, and terra-cotta products. The under clays, which occur with coal beds, are mined principally for the manufacture of hotel ware, jugs, crocks, and electrical fixtures.

Silurian Clays.—The base of the Silurian in West Virginia is limestone. The surface is covered by a red-clay soil 5 to 30 ft. in depth. It is quite low in lime and the percentage of silica is very high, which shows that it has not been formed by the weathering of limestone. The clay makes a very good grade of building brick. It is used at Charles Town and Shepherdstown in Jefferson County and at Martinsburg in Berkeley County.

Devonian Clays.—The clays of the Devonian are extremely shaly but many of these argillaceous shales are suitable for brick manufacturing. These clay shales are used at Elkins, Randolph County, for the manufacture of common brick.

Mauch Chunk Shales.—This geologic division consists of red and grayish blue shales, green sandstone, and a few thin limestones. The red shales and the clays which result in the weathering in many places make a good quality of common red brick, and some of them are of good enough quality to make a beautiful pressed brick. Very little use has been made of them.

Pottsville Series.—The only clay used in this series occurs near its top and is known as the Mount Savage fire-clay. It has been used extensively in Alleghany County, Maryland. These clays have been used for the manufacture of paving and fire brick at Piedmont, Mineral County.

Allegheny Series.—This group of rocks contains valuable deposits of clays in many localities in the state. The two most important are the Kittanning and the Freeport clays. The shales in this series are used at New Cumberland, Hancock County, for the manufacture of brick, paving blocks, and sewer pipe. Many plants are located in the vicinity of New Cumberland.

The only other plant in the state where Kittanning clays are worked is at Hammond, Marion County, 6 mi. southeast of Fairmont.

The Upper Freeport clay is not used in West Virginia at present but its numerous outcrops indicate that it may have commercial value.

Conemaugh Series.—Small beds of clay are locally present at some localities in this group of rocks. One of these clays is produced and mined at Thornton in Taylor County. The shaly clays which occur in the Conemaugh Group are manufactured into building and paving brick. Conemaugh Clay has been used at Morgantown in Monongalia County and Huntington in Cabell County.

Single Gyratory Replaces 3 Older Machines in English Plant

In a description of the Colwick plant of the Trent Concrete, Ltd., near Nottingham, England, published originally by *Cement, Lime and Gravel* (an English journal) and reprinted in PIT AND QUARRY of July 29, 1931, the following statement was made: "The firm is installing a new gravel plant at Newark and is so delighted with the performance of the gyratory machine that the whole of the crushing operation at the new plant will be done by these machines." Unfortunately, this sentence followed—without paragraph separation—several statements regarding the performance of two Symons cone crushers and therefore gave some readers the impression that the new machines were to be of Symons manufacture, even though the quoted statement used the words "gyratory machine" in referring to the crusher which had proved so satisfactory and the Symons machine is not generally so named. The "gyratory machine," as stated earlier in the article, was "the first Kennedy gyratory crusher to be erected in England."

A letter from Trent Concrete, Ltd., states: ". . . . the only crushing unit at the installation of our Newark plant was a No. 19 Kennedy crusher. We are also pleased to inform you that a second No. 19 Kennedy has been installed and that the two machines are crushing the whole of the product at this branch."

According to information contained in a letter from the Kennedy Van Saun Mfg. & Eng. Co. of London, the method of producing chippings at the Colwick plant employed a primary jaw crusher, a secondary cone crusher, and a set of granulating rolls. The company made a test of a No. 19 Kennedy ball-bearing gearless crusher and learned that the primary jaw crusher and the granulating rolls were unnecessary when the Kennedy gyratory machine was used. This is the "gyratory machine" referred to in that part of the sentence first quoted: ". . . . is so delighted with the performance of the gyratory machine that the whole of the crushing operation at the new plant will be done by these machines." The Trent company built a new plant at Newark, near Nottingham, and installed there the No. 19 Kennedy crusher which it had tested at Colwick. This was the only crushing unit of any kind installed there.

The product of this new plant is crushed river gravel—screened to the following sizes: ¾ in., ½ in., ⅜ in., ¼ in.—and washed sand. The company washes out the sand and then feeds everything as it is dredged from the river direct to the No. 19 crusher.

"After about nine months' operation the demand for the product in the Newark district had increased to such an extent," says the letter, "that the company decided to install another crusher, and we received the order for a second No. 19, and this second crusher has been in satisfactory operation for the past three months"—the letter is dated Oct. 9, 1931—"doing the same work as the first one."

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

H. P. MARGERUM

President
Erwin Feldspar Co.
Trenton, N. J.

Coming Events

March 10, 1932. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

March 15-16, 1932. Chicago, Ill. Annual convention, American Railway Engineering Assn., Palmer House, E. H. Fritch, secretary, 59 E. Van Buren St., Chicago.

April 6, 1932. Chicago, Ill. Tenth Annual Midwest Safety Conference. G. G. Traver, manager, Chicago Safety Council, 130 N. Wells St., Chicago.

April 19-21, 1932. Columbus, O. Fifth All-Ohio Safety Congress. T. P. Kearns, Ohio Industrial Commission, Columbus.

May 5, 1932. Newark, N. J. Eighth Annual Eastern Safety Conference. F. M. Rosseland, secretary, Newark Safety Council.

May 19, 1932. Erie, Pa. Seventh Annual Northwestern Pennsylvania Safety Conference. S. M. Lippincott, secretary, Erie Safety Council.

June 20-24, 1932. Atlantic City, N. J. Annual meeting of American Society for Testing Materials. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

October 3-7, 1932. Washington, D. C. Twenty-first Annual Safety Congress, National Safety Council. W. H. Cameron, secretary, 20 N. Wacker Drive, Chicago, Ill.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

Fifteen Years Ago

IMPROVEMENTS costing more than $60,000 were being started at the plant of the Dick Sand Co., located near Polk, Pa. Included in the new equipment installed was a Marion steam shovel. The additions were to give the plant a capacity of 1,000 tons per day as compared with a previous output of 300 tons.

* * *

The Sussex Limestone Products Corp. of Franklin, N. J., was incorporated with a capital of $200,000. The incorporators were Charles G. Wingate, Robert Kuzmier and Thomas G. Durkon.

Ten Years Ago

THE Cairo Sand & Gravel Co. began producing on the Mississippi River near Cairo, Ill. Material was being taken from a bar in the river by a Link-Belt cableway excavator operating over a 700-ft. span. A. S. Fraser was superintendent of the operation.

* * *

Plans were being formulated for the installation of a new sand-and-gravel plant at the junction of the Doe and Watauga Rivers near Johnson City, Tenn., by the Doe River Sand Co. R. N. Campbell, president, was in charge of development and operations.

* * *

The Signal Mountain Portland Cement Co. had begun work on the construction of its 5,000-bbl. plant located at the foot of Signal Mountain near Chattanooga, Tenn. A. C. Deer, general manager of construction, was directing the work and 300 men were employed in the building.

* * *

L. E. Denton was named president of the Michigan Sand and Gravel Producers Assn. at the annual meeting held at Lansing. Other officers were: W. F. Fisher, vice-president; P. D. Hoel, secretary-treasurer; executive committee, W. F. Bradley, H. N. Battjes, W. H. Allswede and R. H. Pardee.

* * *

The Bath Portland Cement Co., operating a plant at Bath, Pa., was taking bids for the erection of another operation at Sandts Eddy, Pa. A capacity of 4,000 bbl. per day was contemplated. Lewis Rafetto was president of the company.

Five Years Ago

AT a meeting of the Midwest Division of the National Crushed Stone Assn. held at St. Louis, these officers were elected to serve during 1927: O. P. Chamberlain, president, and F. C. Murphy, secretary-treasurer. Freight rates and the standardization of screen sizes were discussed at the gathering.

* * *

A new 600-ft. steamer was under construction at a Toledo ship-yard by the United States Steel Corp., to be put in service on the Great Lakes for transporting limestone and other materials. The vessel was to be christened the *B. F. Affleck* in honor of the president of the Universal Portland Cement Co., a United States Steel Corp. subsidiary.

* * *

The Portland Cement Assn. announced the resignation of Duff A. Abrams, director of its research laboratory. He was succeeded by F. R. McMillan, who was given the title of director of research. H. F. Gonnerman, who had previously been an associate engineer, was appointed director of the laboratory.

* * *

New incorporations included the following: Standard Rock Asphalt Co., Bowling Green, Ky., $1,500,000; Volunteer Portland Cement Co., Knoxville, Tenn., $1,000,000; Penglase Sand & Gravel Co., Grayville, Ill., $30,000; Centerville Limestone Co., Centerville, O., $40,000; Monmouth Washed Sand & Gravel Co., Freehold, N. J., $100,000; Havlik Stone Co., Aurora, Ill., $60,000.

Appoints New Wisconsin Firm as Representative

The Barber-Greene Co. of Aurora, Ill., manufacturer of standardized material-handling machines, announces the appointment of the Boehck Equipment Co. of Milwaukee to represent the company in Wisconsin.

The Boehck Equipment Co. is a new organization with offices and warehouse at 2404 W. Clybourn St. Years of experience with conveyors, ditchers, and loaders, and the planning of yards and plants fully qualify the members of the firm to sell and service Barber-Greene machines in their territory.

New Incorporations

MARBLE & STONE COMPANY OF CANADA, LTD., Toronto, Ont. Capital, $50,000; 500 shares, $100 par value. Andrew A. Schuyler and Lily Illingworth. To quarry marble and stone.

BLACK CREEK LIMESTONE CO., INC., Oneida, Wis. Capital, $25,000; 250 shares @ $100. R. A. Murphy, A. A. Vissers and Mary Murphy. To crush gravel and rock.

AVOCA STONE CO., Avoca, Ky. Capital, $25,000. Thomas J. Wood, James W. Stites and James P. Helm, Jr.

COMMERCIAL ROCK CO., Los Angeles, Cal. 1,000 shares n.p.v. Dewey L. Hollidays, Thomas H. Cannan and M. G. Harmany.

CAST STONE PRODUCTS CO., Houston, Tex. C. F. Fleming, 7121 Harrisburg Blvd., and others.

ISCHE SAND & GRAVEL CO., Port Washington Rd., Milwaukee, Wis. Capital, $20,000. A. C. Ische, V. L. Ische and H. C. Ische.

RED-D-MIX CONCRETE (HAMILTON) LTD., Hamilton, Ont. 300 shares preferred @ $100; 5,000 shares common n.p.v. Conlin W. G. Gibson, Robert F. Inch and Henry E. B. Coyne. To produce concrete and by-products.

Personal Mention

Edward Rarig, contractor at Rington, Pa., recently purchased a 100-acre tract of limestone deposits near that place. Construction of plant buildings is already in progress and considerable crushing, screening and conveying equipment has been ordered and will be installed immediately upon arrival.

C. A. McKeever, representative at Georgetown, Pa., for the W. M. Roberts Co., New Castle, Pa., has completed arrangements for the acquisition of a seven-acre tract of sand-and-gravel deposits along the Ohio River near Georgetown for his company. Material will be produced during the year for road work.

E. D. Vestor has begun the production of sand and gravel at a small pit which he recently acquired near Wyoming, Ill.

George Nicholson, Jr., of Manistique, Mich., founder of the old White Marble Lime Co., quietly observed his eightieth birthday at his home recently. Mr. Nicholson was a leader in the limestone and lime industry in the upper peninsula of Michigan for years and, despite his advanced age, is quite active and is reported to be enjoying good health.

A. E. Ballin, a former president of McIntosh & Seymour Corp., Auburn, N. Y., manufacturer of Diesel engines, has been elected vice-president of the Nordberg Mfg. Co., Milwaukee, in charge of engineering and sales. **Robert E. Friend** was reëlected president at the annual meeting of the directors; **Edwin C. Bayerlein** was elected senior vice-president and treasurer; **George W. Lowe** was reëlected secretary, and **James A. Friend,** assistant secretary.

Charles B. King has resigned as vice-president of the Marion Steam Shovel Co., Marion, O. He had been connected with the company 37 years.

R. Wirth has been appointed by Foote Bros. Gear & Machine Co., Chicago, to succeed **A. H. Tischer** as district representative on IXL gears and speed reducers for the Indiana territory comprising the state of Indiana south of a line drawn east and west just south of Fort Wayne. The territory also includes the Ohio river towns in the state of Kentucky adjacent to Indiana. Mr. Wirth is a mechanical engineer with a wise experience in the design of special machinery and power transmission equipment, conveyors, plant layout, and stoker design. His headquarters have been established at 617 Merchants Bank Bldg., Indianapolis, Ind.

Charles L. Close, chief engineer of the Erie Stone Co., Huntington, Ind., has completed plans for the remodeling of the company's plant. Vibrating screens will replace the revolving screens formerly used and additional machinery is to be installed.

Peter King has opened a small quarry on a deposit near Cazenovia, Wis. Most of the product will be pulverized for agricultural use and will be sold in that immediate vicinity.

John Halquist has purchased the crushed-stone operations at Sussex, Wis., formerly operated by **Matt Weber.** Production on an increased scale will be started shortly, it is reported.

Harry J. Larkin, secretary and general manager of the Rock Island Sand & Gravel Co., of Rock Island, Ill., was elected president of the Quad City Builders' Club at its annual meeting held recently. The club is composed of building-materials men of Rock Island, Moline, Ill., Davenport, Ia., and East Moline, Ill.

G. J. Patterson, a director of the Standard Trap Rock Co. and of the Seaboard Sand & Gravel Co., both of New York, has been made a director of the Manufacturers Trust Co. of New York.

Jay E. Jellick has been placed in charge of the San Francisco office of the Portland Cement Assn. which was recently reopened. Mr. Jellick has been active for several years in construction and promotional work on the Pacific Coast. He was formerly in charge of the association's Los Angeles office and was later manager of Pacific Coast offices.

W. B. Stoker is installing equipment for the production of rock asphalt at a deposit located near Pleasanton, Kan.

Edward Johnson is about to begin alterations to his rock crushing plant at 9750 Oswego street, Van Nuys, Cal. Mr. Johnson's address is 432 Western Pacific Bldg., Los Angeles, Cal.

W. A. Rosenberger has been advanced to the position of chief engineer by The Pangborn Corp. of Hagerstown, Md., manufacturers of blast-cleaning and dust-collecting equipment. Mr. Rosenberger, a native of Switzerland, graduated in 1909 from the Polytechnikum at Zurich, and came to the United States. For twenty years he has specialized in blast-cleaning and dust-collecting problems, making many valuable contributions, in the form of inventions and designs, to each.

A. Genco has sold his gravel pit located near Mason, Mich., to the Ingham County road commission. The county plans to produce considerable quantities of material from the pit during the coming season for maintaining farm-to-market roads in outlying sections.

J. M. McCutchan, owner of the Henry County Marble Works at Paris, Tenn., has purchased additional land adjacent to the plant for expansion. The operations were damaged by fire recently and, in addition to repairing and replacing the original equipment, much new machinery is to be installed, according to Mr. McCutchan.

A. J. Sanford, formerly connected with the Timken Roller Bearing Co., Canton, O., has been elected vice-president of the Cleveland Hardware Co., Cleveland. Previously he was affiliated with the Marion Steam Shovel Co. and Huber Manufacturing Co., Marion, O.

Edward D. Boyer, cement technologist of the Atlas Portland Cement Co. and later with the Universal-Atlas Cement Co., following the merger has opened an office for consulting practice in New York, N. Y.

Obituary

Albert L. Schultz, 69 years old, machinery manufacturer, engineer and sand-and-gravel producer, died at his home in Chicago after an illness of two months. Mr. Schultz, a native of Germany, was brought to Chicago by his family in his infancy. He had been in business for himself since 1896. At the time of his death he was president of A. L. Schultz & Son, the South Elgin Sand & Gravel Co., and a director in the Ravenswood National Bank. He was formerly president of the Gary Brick Co. Surviving are his widow, Mrs. Amalia Schultz, and three children.

George R. Thomson, 72 years old, retired secretary and director of the Dolese & Shepard Co. of Chicago, died recently. Mr. Thomson had been a resident of Chicago for half a century. Surviving Mr. Thomson are his widow, Margaret, and two sons, Oliver A., of Kansas City, and Harry C., of Baltimore.

John H. Schulte, age 57, died at his home in Covington, Ky., recently. Mr. Schulte was president of the Ohio Valley Rock Asphalt Co. of Louisville, Ky.

Latest Portland-Cement Statistics

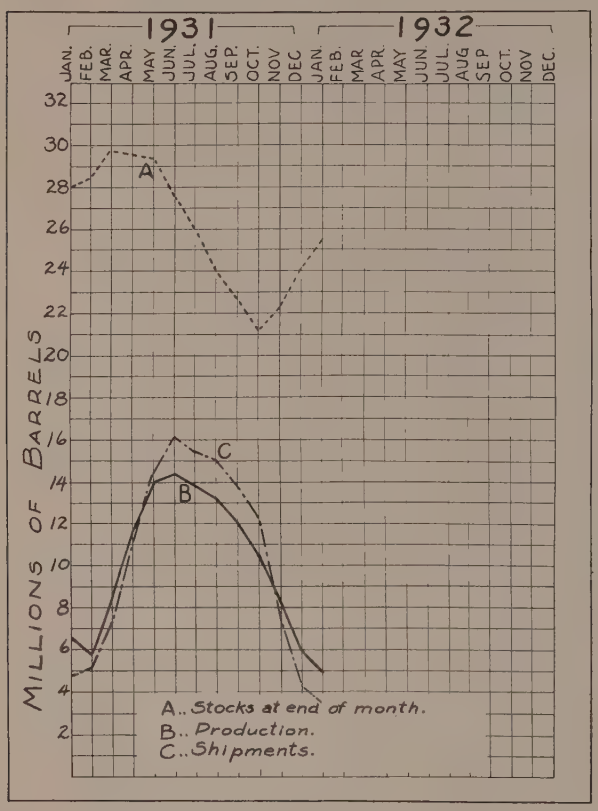

1931
1932
JAN. FEB. MAR. APR. MAY JUN. JUL. AUG. SEP. OCT. NOV DEC.
JAN. FEB. MAR APR. MAY JUN JUL. AUG SEP OCT. NOV DEC.
MILLIONS OF BARRELS
32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2
A
B
C
A.. Stocks at end of month.
B.. Production.
C.. Shipments.

Chart showing production, shipments and stocks on hand, by months, from January, 1931, to January, 1932.

THE Portland cement industry in January, 1932, produced 4,989,000 bbl., shipped 3,363,000 bbl. from the mills, and had in stock at the end of the month 25,568,000 bbl. Production in January, 1932, showed a decrease of 24.4 per cent. and shipments a decrease of 28.3 per cent., as compared with January, 1931. Stocks at the mills were 7.9 per cent. lower than a year ago.

In the statement of relation of production to capacity, the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of January, 1932, and of January, 1931. The estimates include increased capacity due to extensions and improvements during the period.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN DECEMBER, 1931

Exported to—	Barrels	Value
Canada	686	$ 2,288
Central America	11,348	18,478
Cuba	702	1,819
Other West Indies and Bermuda	1,669	3,088
Mexico	1,437	4,416
South America	4,979	18,579
Other countries	1,066	5,360
	21,887	54,023

DISTRIBUTION OF CEMENT

Shipped to—	November		December	
	1930	1931	1930	1931
Alabama	67,219	26,734	77,946	21,963
Alaska	158	1,639	142	25
Arizona	31,593	17,011	30,171	15,640
Arkansas	89,411	34,693	63,553	17,112
California	665,028	470,754	704,699	322,270
Colorado	41,748	38,404	19,474	22,047
Connecticut	113,957	115,800	68,997	51,564
Delaware	17,889	18,229	12,883	11,461
District of Columbia	84,931	95,710	59,861	77,875
Florida	74,271	37,769	60,233	33,081
Georgia	103,952	128,392	86,898	83,222
Hawaii	17,979	21,519	19,770	12,473
Idaho	13,538	9,077	4,829	3,286
Illinois	655,302	406,836	247,845	193,244
Indiana	160,458	138,043	80,190	72,495
Iowa	98,047	75,393	40,965	34,916
Kansas	153,458	85,981	78,186	86,455
Kentucky	102,299	90,891	54,631	49,417
Louisiana	133,845	260,677	130,600	77,914
Maine	53,127	24,292	26,759	11,145
Maryland	119,436	198,975	84,223	133,256
Massachusetts	248,481	230,690	153,583	110,738
Michigan	407,866	191,760	194,610	119,925
Minnesota	89,729	91,214	64,412	35,166
Mississippi	34,044	15,557	32,986	5,820
Missouri	413,025	213,618	188,762	178,052
Montana	20,597	9,559	9,612	3,697
Nebraska	68,717	51,826	21,890	25,655
Nevada	6,681	14,780	1,916	12,587
New Hampshire	24,958	30,307	12,673	9,272
New Jersey	403,664	398,550	259,936	212,095
New Mexico	17,445	11,949	12,929	9,934
New York	1,233,534	1,227,819	867,187	760,928
North Carolina	63,911	55,078	42,274	35,452
North Dakota	7,734	6,173	2,352	1,258
Ohio	614,013	372,879	238,538	194,959
Oklahoma	195,644	124,304	135,784	121,420
Oregon	87,098	52,811	53,936	16,332
Pennsylvania	517,568	528,285	431,241	298,610
Porto Rico	125	9,270	6,918	8,525
Rhode Island	34,865	35,781	20,270	26,601
South Carolina	177,632	166,201	132,992	52,483
South Dakota	17,948	14,229	7,187	8,749
Tennessee	117,871	95,367	74,077	44,322
Texas	454,199	369,500	339,964	223,504
Utah	21,142	12,905	4,271	6,861
Vermont	21,939	15,769	2,678	5,602
Virginia	102,029	117,236	77,370	78,200
Washington	262,159	71,393	185,135	50,654
West Virginia	105,304	83,551	56,245	50,176
Wisconsin	157,633	153,691	62,793	73,102
Wyoming	8,763	4,908	3,028	2,661
Unspecified	13,633	53,609	427	0
	8,747,597	7,127,388	5,650,831	4,114,201
Foreign countries	36,403	28,612	37,169	27,799
Total shipped from cement plants	8,784,000	7,156,000	5,688,000	4,142,000

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN DECEMBER, 1931

Imported from	District into which imported	Barrels	Value
Canada	Maine and New Hampshire	32	$ 85
Cuba	Porto Rico	1,136	1,688
Denmark	Porto Rico	11,630	8,796
Japan	Hawaii	1,979	2,341
United Kingdom	Florida	609	863
	New York	24,761	20,541
	Total	25,370	21,404
	Grand total	40,147	34,314

RELATION OF PRODUCTION TO CAPACITY

	January		December	November	October
	1931 (per cent.)	1932 (per cent.)	1931 (per cent.)	1931 (per cent.)	1931 (per cent.)
The month	29.5	22.0	26.4	37.2	47.4
The 12 months ended	60.6	45.9	46.5	44.4	48.6

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1931 AND 1932 (*thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1931	1932	1931	1932	1931	1932
January	6,595	4,989	4,692	3,363	27,759	25,568
February	5,920		5,074		28,612	
March	8,245		7,192		29,676	
April	11,245		11,184		29,715	
May	14,010		14,200		29,554	
June	14,118		16,077		27,602	
July	13,899		15,545		25,934	
August	13,549		15,172		24,313	
September	12,092		13,671		22,736	
October	10,762		12,360		21,218	
November	8,161		7,156		22,219	
December	5,974		4,142		23,942	
Totals	124,570		126,465			

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, in JANUARY, 1931 and 1932 (*thousands of barrels*)

District	Production		Stocks at end of Month	
	1931	1932	1931	1932
Eastern Pa., N. J., and Md	1,878	1,599	1,329	909
New York and Maine	659	467	902	596
Ohio, Western Pa., and W. Va	724	454	1,290	895
Michigan	445	253	1,271	731
Wis., Ill., Ind., and Ky	1,000	758	1,091	719
Va., Tenn., Ala., Ga., Fla., and La	587	512	966	790
Eastern Mo., Ia., Minn., and S. Dak	898	531	584	456
W. Mo., Neb., Kan., Okla., and Ark	550	693	666	643
Texas	315	284	339	295
Colo., Mont., Utah, Wyo., and Idaho	128	73	276	162
California	686	448	1,175	1,545
Oreg. and Wash	259	35	495	401
Totals	8,129	6,107	10,384	8,142

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JANUARY, 1931 AND 1932, AND STOCKS IN DECEMBER, 1931 (*thousands of barrels*)

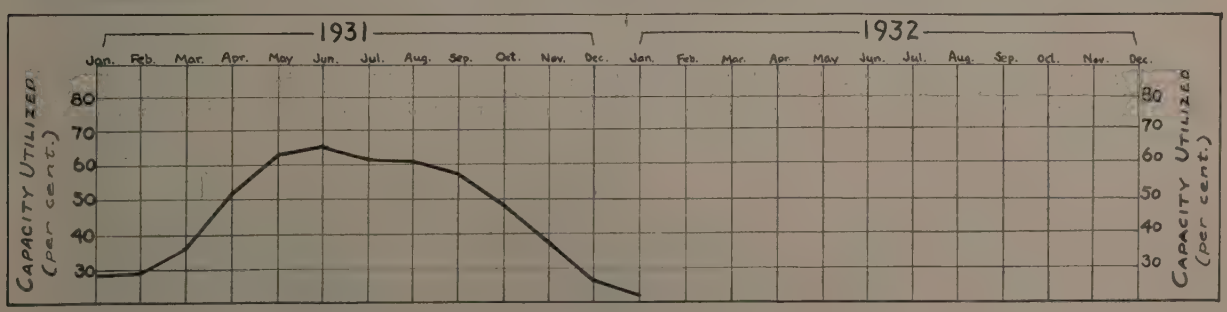
District	December						Stocks at End of December 1931
	Production		Shipments		Stocks at End of Month		
	1931	1932	1931	1932	1931	1932	
Eastern Pa., N. J., and Md	1,617	1,511	1,084	1,073	5,546	5,212	4,774
New York and Maine	420	279	206	199	1,988	1,423	1,343
Ohio, Western Pa., and W. Va	504	246	367	239	3,709	3,477	3,470
Michigan	45	164	220	121	2,915	2,099	2,057
Wis., Ill., Ind., and Ky	804	540	354	237	3,955	3,120	2,817
Va., Tenn., Ala., Ga., Fla., and La	646	425	679	404	1,766	1,817	1,796
Eastern Mo., Ia., Minn., and S. Dak	854	534	288	142	3,069	823	3,098
W. Mo., Neb., Kan., Okla., and Ark	450	530	321	194	2,218	1,817	1,481
Texas	322	338	340	241	782	823	726
Colo., Mont., Utah, Wyo., and Idaho	123	39	50	33	410	486	480
California	624	336	643	413	831	1,154	1,231
Oreg. and Wash	186	47	140	67	570	640	669
Totals	6,595	4,989	4,692	3,363	27,759	25,568	23,942

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1930 AND 1931

Month	Exports				Imports			
	1930		1931		1930		1931	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	82,387	$293,135	41,199	$115,678	201,609	$207,461	97,057	$132,937
February	64,267	217,798	25,703	88,989	114,455	119,717	22,370	26,250
March	117,563	357,896	54,599	144,579	43,622	59,981	70,532	80,686
April	57,419	200,217	40,478	116,564	140,871	178,226	54,717	61,728
May	57,423	198,170	48,028	140,953	94,696	111,998	20,061	22,794
June	82,077	223,639	43,619	107,977	55,356	74,370	32,080	42,955
July	47,082	166,577	29,494	97,995	12,404	20,973	17,445	22,349
August	49,031	167,579	39,517	106,643	35,323	39,029	9,760	13,404
September	46,664	153,384	27,543	81,399	51,096	59,721	33,575	33,520
October	62,690	190,305	24,531	68,524	75,284	84,364	39,642	43,380
November	50,495	151,555	33,200	97,796	109,124	125,448	27,940	22,235
December	38,680	134,260	21,887	54,028	44,157	59,641	40,147	34,314
Totals	755,778	$2,454,515	429,653	1,220,600	977,997	$1,140,929	457,238	507,918

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1931 AND 1932 (*thousands of barrels*)

Month	Production		Stocks End of Month		Month	Production		Stocks End of Month	
	1931	1932	1931	1932		1931	1932	1931	1932
January	8,129	6,107	10,384	8,142	July	12,246		10,209	
February	7,473		11,946		August	11,664		8,468	
March	9,586		13,318		September	10,414		6,918	
April	11,540		13,854		October	9,825		6,021	
May	13,159		13,087		November	8,259		6,215	
June	12,679		11,837		December	6,840		6,973	



Production capacity utilized by months, January, 1931, to January, 1932.

Traffic News and Comment

Recent I. C. C. Decisions

Cement.—In prescribing rates on cement from the Kansas "gas belt," Dewey and Ada, Okla., El Paso and other Texas points to destinations on the Texas-New Mexico in Texas and New Mexico, the commission said: "We find that the rates on cement in car-loads, from origins in the Kansas 'gas belt' and from Dewey to destinations on the Texas-New Mexico, are and for the future will be unreasonable to the extent that they exceed or may exceed Scale IV rates as set forth on p. 87 of Appendix A of the Texas case, applied as provided in Appendix B to said report; provided, that the rates from Chanute, Dewey, Fredonia, Humbolt, Iola, Independence, and Mildred shall be based on the distance from Chanute to the respective destinations; provided further that for the period of the emergency, the increase authorized in Fifteen-Per Cent. Case 1931 may be added to the rates herein found reasonable. We further find that the rates assailed were, prior to Jan. 4, 1932, unreasonable to the extent that they exceeded Scale IV rates as set forth above, and that they were unreasonable on and after said date to the extent that they exceeded Scale IV rates applied as provided above, plus the specific increases authorized in the Fifteen-Per Cent. Case 1931." The Texas case referred to in the findings is reported in 128 I. C. C. 63. New rates are to be made effective not later than May 16—I. C. C. Dockets No. 23,898, Iola Cement Mills Traffic Assn. *et al. v.* A. T. & S. F. *et al;* No. 23,899, Southwestern Portland Cement Co. *v.* T. & P. *et al;* No. 23,-902, Oklahoma Portland Cement Co. *v.* A. T. & S. F. *et al;* No. 23,995, San Antonio Portland Cement Co. *v.* I. -G. N. *et al;* and No. 24,133, Republic Portland Cement Co. *v.* G. C. & S. F. *et al.* (For abstract of examiner's report see PIT AND QUARRY Aug. 12, 1931, p. 66.)

Slag.—The commission has prescribed, to be made effective not later than April 15, rates on slag from points in eastern Pennsylvania to destinations in New England and trunk-line territories based on mileage scales. Scale A provides rates to destinations in Delaware, Maryland, New Jersey, New York, Virginia, West Virginia and the District of Columbia, for single-line movements, to which is to be added an arbitrary of 20 c. on shipments involving two or more line-haul carriers, and is further subject to the addition of 70 c. per ton for hauls involving car-float or lighterage service in the New York Harbor district on traffic to points in New York, including destinations on the Long Island Railroad in Group A. Rates to points in Groups B, C and D on the Long Island are to be made by adding to the rates to Group A points, 20 c. to Group B, 30 c. to Group C, and 60 c. to Group D. Scale B provides rates to destinations in New England and is subject to the 20-c. arbitrary for joint-line movement and to the 70-c. arbitrary for movement via car-floats or lighters in the New York Harbor district. Mileages are to be computed over routes composed of not more than three line-haul carriers by existing connections for the interchange of car-load traffic which will make the lowest rates taking into consideration the arbitraries shown above. In computing rates on routes involving car-float or lighterage service in New York Harbor, only actual rail distances will be used, the 70-c. arbitrary taking care of this service. The emergency charges authorized in Ex Parte 103 may be added to the rates prescribed herein. Finding that the rates assailed in No. 22,511 have been unreasonable since Oct. 30, 1928, to the extent that they have exceeded rates prescribed for the future, reparation has been awarded. In the other cases rates were found to be unreasonable but not otherwise unlawful.—I. C. C. Dockets No. 22,596, National Slag Co. *et al. v.* Atlantic City R. R. *et al;* No. 22,596, Sub. 1, Duquesne Slag Products Co. *v.* Same; No. 22,596, Sub. 2, William S. Buckland, trading as the Philadelphia Slag Co., *v.* Same; 22,954, Keystone Slag Co. *v.* Same; and No. 22,511 Keystone Slag Co. *v.* B. & A. *et al.*

Talc.—A car-load of crude ground talc from Emeryville, N. Y., to Lynchburg, Va., was misrouted by the New York Central. The rate charged was applicable over the route of movement, and was not unreasonable. The rate applicable over the route over which the shipment should have moved was unreasonable to the extent it exceeded 36½ c., and reparation of $32.40 was awarded.—I. C. C. Docket No. 24,587, Traffic Bureau, Lynchburg, Chamber of Commerce *v.* C. & O. *et al.*

Examiners' Reports

Sand.—Examiner Paul R. Naefe proposes that the commission find the rate charged on the shipment of sand from Memphis, Tenn., to Red Bay, Ala., applicable, and that the complaint be dismissed.—I. C. C. Docket No. 24,691, Nixon & Phillips *v.* I. C. (See PIT & QUARRY Oct. 21, 1931, p. 77.)

New Complaints Filed

Cement.—The commission has suspended until Sept. 15 schedules in supplements Nos. 38 and 39 to B. & O. I. C. C. No. 21,475, which propose to increase the rate on cement from Securety, Md., to Rosslyn, Va., from 11½ c. to 12 c. per 100 lb.—I. & S. Docket No. 3,701.

Crushed Stone, Sand, Gravel and Slag.—On petition of various carriers operating in Ohio the commission has on its own motion instituted a thirteenth-section inquiry into the rates on crushed stone, sand, gravel, and slag within the state of Ohio, established and maintained by orders of the Ohio Public Utilities Commission. This investigation has been joined with the proceedings in Docket No. 24,597, and four sub-numbers, which complaints were abstracted in PIT AND QUARRY, Sept. 23, 1931, p. 72. The five complaints were set for hearing on Nov. 4, at Columbus, O., but this hearing was postponed indefinitely by the commission. Practically all the producers of these commodities in Ohio have intervened, either directly or through their organization. In the original complaints shippers in western Pennsylvania, whose rates are made on basis of the West Penn or Docket No. 15,329 Scale, ask that the same basis be established on Ohio intrastate traffic. Under Sec. 3 and 13 rates from virtually every producing point in the state were attacked. At present there is no established mileage-scale basis for making rates on these commodities within the state, although at a special meeting of the Central Freight Association, No. 923, a scale, known as P. S. M. 923 Scale, was adopted by the carriers for making rates thereafter. This scale was adopted Feb. 3, 1926, but shippers contend that the scale is so high that very little traffic is moved on these rates. Most of the crushed stone is produced in the western part of the state, while sand-and-gravel plants are found in all parts except the northwest, and slag plants at steel-producing points. Owing to the good roads which radiate from all producing points, motor-truck competition is very keen and shippers generally seem to feel that the application of the West Penn Scale will drive most of the business to the trucks. While the carriers are anxious that a definite basis for making rates be established, they want the shippers to propose the basis and, through the leadership of W. D. Goble, Traffic Manager of the National Lime & Stone Co., of Findlay, O., and Paul Hodges, vice-president, in charge of Traffic of the Marble Cliff Quarries Co., Columbus, O., together with representatives of the National Sand & Gravel Assn., shippers are attempting to arrive at some definite basis or bases for constructing rates. There are so many angles to this situation, no small part of which is the water competition on

Lake Erie, that this case is being followed with a great deal of interest by traffic men not only in Ohio but throughout the central territory. In the carriers' petition the orders of the Ohio commission between Sept. 29, 1921 and May 25, 1929, are alleged in violation of Sec. 13.—I. C. C. Docket No. 25,020.

Fluorspar.—The commission has suspended until Sept. 15 various schedules filed by the B. & O., P. R. R., P. & L. E., W. & L. E., and L. & W. V., proposing to revise the rates on fluorspar, ex-river, which would result both in increases and reductions. These rates are applicable between points in C. F. A. territory. Some of them would amount to almost 50 per cent. as, for example, the rate from Martin's Ferry, O., to Canton, O., would be increased from $1.50 to $2.20 per net ton. I. & S. Docket No. 3,699.

Various Commodities, Emergency Charge.—Sixth-section permission to reissue the tariff of emergency charges on 10 days' notice has been asked by B. T. Jones, agent. The application states that the charge on ball clay, bentonite, china clay, gilsonite, kaolin and pipe clay is to be increased from 12 c. per ton to 1 c. per 100 lb. They propose to reduce the charge on fullers' earth and tripoli, chemical lime, fluxing lime, and high-temperature bonding mortar from 2 c. to 1 c. per 100 lb. and on marl from 1 c. per 100 lb. to 12 c. per ton.—I. C. C. Ex Parte 103.

Rate-Committee Dockets

Trunk Line Assn.

Asbestos.—Carriers propose to establish a rate of 32 c. per 100 lb. on asbestos refuse or shorts testing 0-0-5-11 or lower, car-load minimum weight 60,000 lb., from Black Lake-Coleraine, East Broughton, Robertson and Thetford Mines, Que., to Asbestos, Pa.—Docket No. 28,630.

Fluxing Stone.—Shippers propose a reduction in the rate on crude, fluxing, foundry and furnace limestone[1], from Thomasville, Pa., to Warren, O., from $2.39 to $1.76 per gross ton, proponent claiming that the proposed rate is fairly comparable with the rate to Youngstown.—Docket No. 28,648.

Crushed Stone.—To meet motor-truck competition carriers propose to reduce the rate on crushed stone and related articles[1], from Cavetown and Securety, Md., to Oldtown and Town Creek, Md., to 75 c. per net ton, to expire Dec. 31, 1932.—Docket No. M-2,003.

Sand.—To meet motor-truck competition shippers propose a reduction in the rate on common sand, from Philadelphia, Pa., to Reading, Pa., to 99 c. per net ton, to expire March 31, and $1.05 a net ton effective April 1.—Docket No. 28,595.

Sand and Gravel.—To meet motor-truck competition shippers propose a reduction in the rate on sand and gravel[1], from Farmingdale, N. J., to Belford, N. J., from 60 c. to 36½ c., to expire Dec. 31, 1932.—Docket No. 28,676.

Plaster.—To eliminate fourth-section departures, carriers propose to revise rates on (A) plaster and plaster articles, and on (B) plaster-board from Clarence Center, Transit, Akron, Oakfield and Wheatville, N. Y., as shown in N. Y. C. I. C. C. 16,278 and W. S. I. C. C. 6,658, as shown below.—Dockets No. 28,658 and No. 26,659.

To	(A) Present	(A) Proposed	(B) Present	(B) Proposed
Sunbury to West Milton, Pa...	15½c.	16c.	17c.	17½c.
Catawissa to Newberry, Pa.	15½c.	16c.	17c.	17½c.
McKinney to Fassett, Pa...	17½c.	16c.	19½c.	17½c.

Central Freight Assn.

Agricultural Limestone.—Carriers propose to increase the rate on agricultural limestone[1], from Whitehouse, O., to Morenci and Britton, Mich., from 92 c. to 97 c. per net ton.—Docket No. 30,517.

Shippers are asking that the rate on agricultural limestone in box cars, car-load minimum weight 50,000 lb., from Gibsonburg and Woodville, O., to Milwaukee, Wis., be reduced from $2.80 to $2.60 per net ton.—Docket No. 30,630.

Gravel.—Carriers propose to establish a commodity rate on crushed or ground gravel[1], from E. St. Louis, Ill., to Cleveland, O., of $1.10 per net ton.—Docket No. 30,629.

Lime.—Carriers propose to reduce the rate on carbonate of lime or re-carbonated waste, car-load minimum weight 50,000 lb., from Painesville, O., to Willoughby, O., from 9 c. to 5 c. per 100 lb.—Docket No. 30,606.

Slag.—Shippers propose the establishment of the following commodity rates on slag, in bulk, in open-top cars, from Hamilton, O.: To Winchester, Ind., 95 c.; to Greenwood, Ind., $1.30; to Huntington, Ind., $1.25 per net ton.—Docket No. 30,538.

Talc.—Shippers at Joliet, Ill., propose that the rates on crude, ground soapstone or talc, in bags, be reduced to Cleveland, O., from $3.40 to $3.00; to Detroit, Mich., from $3.00 to $2.94; and to South Bend, Ind., from $2.00 to $1.89 per net ton.—Docket No. 30,605.

Western Trunk Line Committee

Crushed Stone.—Shippers are proposing a line of commodity rates on crushed stone[1], from Valmeyer, Ill., to points in Iowa, Nebraska, North Dakota and South Dakota. Representative rates are shown below. Complete copy of exhibit will be furnished on request.—Docket No. 6,025-E.

To	Proposed
Omaha, Neb.	$2.90
Mitchell, S. D.	5.40
Sioux Falls, S. D.	5.30
Rapid City, S. D.	7.10
Fargo, N. D.	6.90

Southern Freight Assn.

Lime.—Carriers propose to reduce the rate on lime, (hydrated, quick or slack) car-load minimum weight 60,000 lb., from $5.22 to $4.16 per net ton.—Docket No. 56,912.

Limestone.—It is proposed to amend Item 25 of Agent Speiden's Barber Limestone Tariff No. 219, I. C. C. 1, 488, naming rates on ground or pulverized limestone from Falling Springs, Va., to southern points, so as to permit less-than-carload shipments of poultry grit, in the same car with less-than-carload shipments of limestone, such less-than-carload shipments of poultry grit not to exceed 10 per cent. of the weight of the limestone, rates to be the same as on oyster shells l.c.l.—Docket No. 56,898.

Sand and Gravel.—It is proposed to add a relief-line arbitrary of 25 c. in connection with rates on sand, gravel and related commodities, from, to, and between stations on East Tennessee & Western North Carolina R. R., east of Elizabethton, Tenn., and from, to, and between Linville River Ry. stations. No change is proposed in present rates from, to, and between E. T. & W. N. C. R. R. stations, Johnson City, Tenn., to Elizabethton, Tenn., inclusive.—Docket No. 56,861.

Southwestern Freight Bureau

Plaster-board.—Shippers at Texas and Oklahoma producing points are asking for the establishment of a line of commodity rates on plaster-board and plaster wall-board to destinations in Indiana and Kentucky on the basis of 20 per cent. of the first-class rate, car-load minimum weight 50,000 lb. As a result of the commission's order in I. C. C. Docket No. 17,006 (Upson case) the rates on plaster-board and plaster wall-board to St. Louis, Mo., and East St. Louis, Ill., were revised to the basis of Col. 20 rates in S. W. L. Tariff 151. Prior to the commission's order the former rates to St. Louis and East St. Louis were used as proportional rates in constructing combination rates to destinations not involved in the commission's order, and the establishment of Col. 20 rates had the effect of cancelling such former rates for proportional application, leaving nothing but full Class C rates in effect to such destinations. It is stated that this basis is prohibitive and, as a result, all plaster-board consigned to the destination involved is moving from producing points other than those involved herein. In order to offer some relief to shippers it is desired to establish Col. 20 rates, which basis was authorized by the commission to other territories.—Docket No. 24,238.

Transcontinental Freight Bureau

Mica.—Shippers request the establishment of a car-load rate of 60 c. per 100 lb., car-load minimum weight 60,000 lb., on crude or ground mica, subject to transit privileges, from Keystone and Custer, S. D., to California destinations in Tariff 37-C.—Docket No. 13,372.

[1] The car load minimum weight will be 90 per cent. of the market capacity of the car except that, when the car is loaded to the full cubical or visible capacity, the actual weight will apply.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Material Service Corp. Reports High Earnings

The annual report of the Material Service Corp. of Chicago, issued February 23 by Henry Crown, president, shows earnings for 1931 in excess of the preceding year. Net profit of $302,080, equivalent to $2.41 a share on the capital stock, was reported for the year, as compared with 1930 net profit of $265,040, or $2.12 a share. Depreciation was $100,990, against $133,000 in 1930.

All officers were reëlected at the annual meeting of directors and Frank J. Fox was named an additional vice-president.

Texas Gulf Sulphur Co. Earnings at High Level

Texas Gulf Sulphur Co. will report a net profit of slightly over $3.50 a share for its 2,540,000 shares of capital stock for 1931, according to preliminary reports. Earnings for the nine months were $6,704,091 equal to $2.64 a share and net in the last quarter was around 86 c. a share.

In the year ended December 31, 1930, net profit was $13,972,085 or $5.50 a share.

United States Gypsum's Net Is $2.48 per Share

The United States Gypsum Co. reports for the year ended December 31, 1931, net income of $3,563,143 after depreciation, depletion, federal taxes, etc., equivalent after 7-per cent. preferred dividends to $2.48 a share (par $20) on 1,217,472 shares of common stock outstanding at end of year. This compares with $5,408,685 or $4.01 a share on 1,212,598 common shares in 1930.

Current assets as of December 31, 1931, including $11,168,419 cash and government and municipal bonds, amounted to $18,157,433, and current liabilities $1,176,287. These figures compare with $9,267,934, $17,226,979 and $1,763,573, respectively, at close of 1930.

Sewell L. Avery, president, stated that he expected no change in the common dividend rate, which is $1.60 annually. Commenting on the possibility of a merger between United States Gypsum and Johns-Manville Corp., he emphatically denied that such a consolidation was being considered. The two companies could not feasibly be brought together, he said, because there is practically no connection between their products and methods of distribution.

Consolidated income account for the year 1931 compares as follows:

	1931	1930
Earnings after expenses	$5,789,927	$7,835,520
Other income	717,212	683,133
Total income	$6,507,139	$8,518,653
Depreciation & depletion	2,256,402	2,163,031
Federal taxes	343,899	687,074
Other deductions	343,695	259,863
Net income	$3,563,143	$5,408,685
Preferred dividends	548,753	543,669
Common dividends	1,906,132	2,469,985
Surplus	$1,108,258	$2,395,031

Consolidated balance sheet as of December 31, 1931, compares as follows:

Assets

	1931	1930
Plant, land, equip., etc.	$48,734,079	$49,726,546
Cash	923,034	728,662
Market securities	10,245,385	8,539,272
Receivables	3,252,113	3,645,531
Inventories	3,736,901	4,313,515
Emp. stock pur. contr.	1,657,750	1,722,273
Bond deposit for insurance reserves	180,592	181,202
Misc. stocks and bonds	86,246	73,379
Deferred charges	1,071,296	937,442
Total	$69,887,396	$69,867,822

Liabilities

Preferred stock	$ 7,822,200	$ 7,841,700
*Common stock	24,349,440	24,251,960
Accounts payable	577,492	601,743
Payroll & accrued taxes	269,510	476,159
Federal taxes	329,285	685,672
Contingent reserve	876,766	903,012
Other reserves	478,954	493,765
Paid-in surplus	6,507,999	6,378,248
Earned surplus	28,675,750	28,235,563
Total	$69,887,396	$69,867,822

* Par $20.

Net Loss for Missouri Portland Cement in '31

The Missouri Portland Cement Co. and subsidiary report for 1931 a net loss of $335,353 before allowance for $521,299 paid in dividends during the year.

This compares with net profit of $1,205,832, or $4.02 a share on 299,284 shares, in the preceding year.

Current assets as of December 31, 1931, were $1,326,039 and current liabilities $91,806, comparing with $2,713,745 and $193,371, respectively, on December 31, 1930. During 1931 the company bought 10,915 shares of its own stock reducing amount outstanding at end of year to 288,369 shares.

Lehigh Portland Cement Has Small 1931 Profit

Lehigh Portland Cement Co. reports for the year ended December 31, 1931, net profit of $79,328 after depreciation, federal taxes, etc., equivalent to 38 c. a share (par $100) on 204,969 shares of 7-per cent. preferred stock.

In the year ended November 30, 1930, the company reported net profit of $2,105,993, equal after dividends on 7-per cent. preferred stock, to $1.46 a share (par $50) on 450,348 shares of common stock. The company's fiscal year has been changed to end December 31, instead of November 30.

Los Angeles Aggregates Firm Reports Profits Up

Notwithstanding the sharp reduction in the volume of construction work carried on in the district served, the operations of Consolidated Rock Products Co. of Los Angeles, Cal., for the year 1931 and the condition of its finances and properties show a marked improvement over the previous year, according to the annual report.

While the tonnage sales in 1931 were 31 per cent. less than those of 1930 the gross profit from operations before depletion, depreciation and amortization was $929,049, an increase of 48 per cent. over that for the year 1930.

The net result after all fixed charges including depletion, depreciation and amortization and bond interest and other income was a loss of $24,518, compared with a net loss for the year 1930 of $620,259.

The current position improved noticeably during 1931; net current as-

(Continued on page 84)

CURRENT DIVIDENDS

Company	Class of Stock	Dividend Rate	Holders of Record	Payable	Company	Class of Stock	Dividend Rate	Holders of Record	Payable
Alpha Portland Cement	Common	$0.25 qr.	Jan. 2	Jan. 25	Missouri Portland Cement	Common	$0.25 qr.	Jan. 21	Jan. 30
Calaveras Cement	Preferred	$1.75 qr.	Dec. 31	Jan. 15	Owens-Illinois Glass	Common	$1.50 qr.	Jan. 30	Feb. 15
Canada Cement	Preferred	$1.62½ qr.	Feb. 29	Mar. 31	Owens-Illinois Glass	Preferred	$1.75 qr.	Mar. 16	Apr. 1
Cleveland Quarries Co	Common	$0.25 qr.	Feb. 15	Mar. 1	Riverside Portland Cement	Preferred	$1.50 qr.	Jan. 15	Feb. 1
Fitzsimons & Connell	Common	$0.50 qr.	Feb. 19	Mar. 1	Smith Agricultural Chemical	Preferred	$1.50 qr.	Jan. 21	Feb. 1
Great Lakes Dredge & Dock	Common	$0.25 qr.	Feb 5	Feb. 15	Standard Pav. & Materials	Preferred	$1.75 qr.	Jan. 30	Feb. 15
International Cement	Common	$0.50 qr.	Mar. 11	Mar. 31	Superior Portland Cement	Class A	$0.27½M	Feb. 23	Mar. 1
International Salt	Common	$0.50 qr.	Mar. 15	Apr. 1	Texas Gulf Sulphur	Common	$0.50 qr.	Mar. 1	Mar. 15
Johns-Manville	Preferred	$1.75 qr.	Dec. 26	Jan. 16	Warner Co	1st Pfd.	$1.75 qr.	Mar. 15	Apr. 1

Review of Foreign Practice

Spain's Cement Outlook Appears Rosy to Editor

In a short review of the condition of the Portland-cement industry in Spain in 1931 and the outlook for 1932, the editor of *Cemento* (Barcelona) sees encouraging signs for the future of the industry. The social disorder and unrest that culminated in the revolution last April had its effect on the cement industry as well as on everything else, though not to the extent that might have been feared. The total sales were somewhat less than those of the previous year, and as several additions to capacity were made, including the erection of one now plant, the utilization of capacity declined somewhat more. Nevertheless, the editor points out that the decline is slight in comparison with the almost total paralysis of public works last year, and notes that capacity has been held up largely by the sales to small users, which point to an increasing use of cement in the future. Spain has also made successful efforts to increase its export business in cement, and Spanish cement was introduced into new markets last year. There is also hope that the fund of 700,000,000 pesetos which was approved in the latter part of 1931 for public works in 1931, 1932, and 1933 will begin to be effective and will stimulate cement requirements.

The Agrupacion de Fabricantes de Cemento Portland de Espana (Association of Portland Cement Manufacturers in Spain) has done development work during the past year that should bear fruit, especially in the sponsoring of courses in the Superior Schools of Architecture in Madrid and Barcelona, given by experts in reinforced concrete.—*Cement* 4:1-2, Jan., 1932.

Action of Sea Water on Concrete Is Discussed

At the Fifteenth International Congress of Navigation ten papers were presented dealing in one way or another with the employment of concrete and reinforced concrete in maritime construction works. These papers contain a quantity of material of interest to producers of cement, some of the most interesting of which is summarized here.

The use of concrete in sea water has replaced almost completely other massive structures or structures of wood, and the concrete is generally cement concrete, although in Italy the jobs executed "in the dry" or within cofferdams are often done with a mortar of lime and possuolana, Portland cement being added when it is necessary to hasten the setting. The use of metallic reinforcements is becoming more and more general; some technologists even advise the employment of reinforcing in all cases so as to avoid any possibility of cracking caused by bending stresses or shrinkage. In structures built with lime and possuolana concrete, no deterioration from the action of the salts dissolved in sea water has been established; works built of Portland cement are almost always altered more or less quickly by the action of the salts. This deterioration is greatest in the parts poured directly into contact with the water; when the concrete is poured previous to its contact with the water and allowed to harden several months in the air, the deterioration is much less. A particular alteration takes place in the region near the water level, either because of the alternation of high and low water or because of the action of the waves.

The degree and rapidity of deterioration are influenced by the degree of compactness of the concrete and by the quantity of free lime present in the cement or liberated during setting and hardening. This means that much care must be given to the granulometric composition of the mix so as to obtain the maximum density; in general, any condition must be avoided which would make the concrete porous, for the infiltration of sea water into the concrete mass hastens the chemical reactions both on the concrete and on the reinforcing iron. The use of high-strength special cements is to be avoided, particularly if their high strength is obtained by increasing the percentage of lime. The use of impermeable protective coatings for concrete has not, in general, given satisfactory results; the calcareous incrustations which are formed on the surface of concrete in sea water constitute, however, a very good protector.

Pozzuolanic materials are sometimes added to concrete to solve the troubles in sea water by fixing the free lime and thus preventing either its entrance into injurious chemical compounds or its dissolution and consequent porosity of the concrete. To use these materials efficiently, however, the possuolanic materials must have a high content of active silica and alumina, and the reaction with the lime must be rapid enough to prevent the washing away of the lime before it is fixed—conditions hard to realize in practice. Considerable work has been done in Italy toward developing a cement with added pozzuolanic materials which have been rendered active by an artificial process.

Fused alumina cement is highly resistant to the action of the salts in sea water, but its use has been restricted by the special precautions to be observed in its use, and by its comparatively high cost.—Pierre Periana in *Le Ciment* 37:7-8, Jan., 1932.

New Calcining Process for Gypsum Is Revealed

Ordinarily the manufacture of calcined gypsum calls for separate machines for the separate processes of grinding, burning and conveying between and after these operations; recently, however, there has been developed in Germany a new manufacturing process which combines these three operations into one aggregate of machines and a single continuous process. The raw gypsum, crushed to ¾ in. to 1 in., is fed directly into the hopper of a screw which feeds a mill that pulverizes the gypsum and feeds the ground particles into the first of three connected vertical tubes through which the particles are carried by a current of hot air. At the bottom of the last tube is a screening device which returns the oversize into the mill; the remainder is carried along with the air current to a cyclone where it is separated from the air and sent to bins.

As the particles are in contact with the hot gases for a brief interval only, and as the particles are passed through the tubes again and again until they are of the proper size, this process eliminates both the undesirable overburned particles and the equally undesirable underburned portions. In an experimental apparatus with tubes 10 in. in diameter and some 50 ft. long, the operation of which was witnessed by the writer, the hourly production was 850 to 900 kg. (1,870 to 1,980 lb.) of raw gypsum, corresponding to 700 to 725 kg. (1,540 to 1,595 lb.) of calcined stucco. The temperature at the entrance to the tubes was 900 deg. C., at the outlet of the tubes 130 deg. C., and the temperature of the calcined gypsum was 125 deg. C. The stucco was burned to a water content of 5.01 per cent., showing that, in spite of the brief stay in the hot zone, the gypsum has been reduced to the hemi-hydrate. Analyses show 1.1 per cent. of foreign substance, 97.1 per cent. of hemi-hydrate and soluble anhydrite, 0.6 per cent. of overburned material, and 1.2 per cent. of underburned material.

In the experimental plant the power consumption is 19.5 hp. per 1,000 kg. of stucco for the whole calcining and grinding apparatus, including the mill, the fan, the feeder screw, and the cyclone. The heat economy is bound to be favorable, as the gases enter the tubes at 800 deg. C. and leave at 130 to 135 deg., instead of entering at 700 and leaving at 150 to 170 as usual; also the stationary tubes can be insulated better than any rotating calcining apparatus. The fuel consumption in the experimental apparatus is 48 kg. of coke with a heat value of 7,500 calories.—Dipl.-Ing. E. Schneider in *Tonindustrie-Zeitung* 56:93-96, Jan. 20, 1932.

Recent Patents

AMERICAN

Cement and Concrete

Method of utilizing free oxygen in the production of cement and iron. Charles H. Hillhouse, New York, N. Y. No. 1,842,609.

Concrete-mixing machine. Karl Piehler, Leipzig, Germany. No. 1,842,879.

Process of rendering cement, mortar, and concrete watertight. Walter Kirchner, Grunau-Berlin, Germany. No. 1,844,663.

Dredging

Control mechanism for hydraulic-dredging apparatus. Clarence H. Bronner, Oakland, Cal., assignor to Westinghouse Electric & Mfg. Co. No. 1,842,537.

Excavating

Intertooth scraper for excavating implements. John O'F. Clark, St. Louis, Mo., assignor to American Manganese Steel Co., Chicago, Ill. No. 1,843,205.

Excavating shovel. Paul Burke, Green Bay, Wis., assignor to Northwest Engineering Corp., same place. No. 1,843,750.

Twin tractor scraper or excavator. Carl C. and Aaron A. Andrews, Harris, Kan. No. 1,843,796.

Drag-bucket. Werner Lehman, South Milwaukee, Wis. No. 1,844,858.

Grading attachment for steam shovels. Albin Farnstrom, Detroit, Mich. No. 1,844,465.

Loading

Loading machine. William E. Ghent, Atlanta, N. Y., assignor to Boggs Mfg. Corp., same place. No. 1,842,399.

Automatic Bucket-loader. Raymond W. Dull, Chicago, Ill., assignor to Link-Belt Co., same place. No. 1,843,124.

Material Handling

Winch-head drive. Rolf Ljungkull, Milwaukee, Wis., assignor to Harnischfeger Corp., same place. No. 1,843,607.

Safety-skip-control device. Charles H. Wagner, Washington, D. C., assignor to Koehring Co., Milwaukee, Wis. No. 1,843,793.

FOREIGN

Cement and Cement Products

Manufacture of special Portland cement. A. F. Fabre. French 39,115—698, 520 (addition).

Process of manufacturing lightweight mortars and concrete. F. C. Marechal. French 39,162—687,189 (addition).

Process for manufacture of a product which makes mortar waterproof. C. Fleisch. French 711,411.

Light cement. E. Prouteau. French 711,689.

Composition made from tripoli in combination with cement. L. M. Daltroff. French 711,754.

Process for continuous manufacture of alumina cement in a rotary kiln. A. Folliet and N. Sainderichin. French 711,846.

Process and apparatus for manufacture of mortar, concrete and the like. E. Freyssinet. French 711,694.

Process for obtaining perfectly smooth surfaces on cast concrete. P. L. J. Baissas. French 711,872.

Crushing and Grinding

Stone-crushers. G. E. Krider. British 365,427.

Hammer pulverizers. Compagnie Francaise Buell Combustion. British 365,597.

Drilling

Valve apparatus for rock drills and like fluid-pressure-operated tools. G. H. T. Rayner and P. T. Rayner. British 365,404.

Hollow drill steels and the like. E. Ameen and R. Olsson. British 365,822.

Kilns

Tunnel kilns. F. M. Hartford and S. M. Kerr. British 365,614.

Method of improving the heat economy in rotary kilns. Fellner & Ziegler Akt.-Ges. British 365,933.

Feeding apparatus for rotary kilns. Adolphe Busch, Antwerp, Belgium. Canadian 319,567.

Lime

Process for hydrating ordinary and hydraulic limes with the aid of reagents. A. Pozzi. French 711,825.

Material-Handling

Grab bucket. Societe Francaise de Construction de Bennes Automatiques. French 710,979.

Loading-chute. G. Zurkin. British 365,385.

Traveling cranes. G. R. Adamson, J. Adamson (trading as J. Adamson & Co.) and A. V. Flinn. British 365,408.

Tubular conveyor systems. Mix & Genest Akt.-Ges. British 365,411.

Elevating-mechanism for tipping cars. F. J. Fagard. British 365,713.

Jigger conveyors. A. Eickhoff. British 365,932.

Mining and Quarrying

Pit props. W. H. Gilson. British 365,460.

Pit prop. P. A. Ball. British 365,556.

Mining apparatus. Sullivan Machinery Co., Chicago, Ill., assignee of Clarence F. Osgood, Claremont, N. H. Canadian 319,702.

Sacking

Sack holder. A. R. Woods. British 365,296.

Valve bag and closure. Rene Jarrier, Saint-Quentin (Aisne), France. Canadian 319,591.

Screening and Separating

Dust-separators. H. H. Bubar. British 365,050.

Dewatering solid materials. P. T. Williams and Minerals Separation, Ltd. British 365,148.

Apparatus for separation of suspended material from gases by centrifugal action. International Precipitation Co. British 365,312.

Separation of intermixed divided materials. R. Peale, W. S. Davies and W. B. Oakes. British 365,606.

Dust separators or collectors for use in conjunction with cement and similar kilns. Vickers-Armstrong, Ltd., L. O. Parker and J. D. Sky. British 365,721.

Method of preparing aggregates. George Miller Thompson, Caledonia, Ont. Canadian 319,616.

Unclassified

Material and process for the manufacture of artificial stone. T. Bianchi. French 710,997.

Process of manufacturing concrete slabs, and machine therefor. Societe Industrielle et Agricole de Libercourt. French 711,724.

Machines or apparatus for washing granular and like materials. F. Parker, Ltd., and F. W. Parker. British 363,654.

Means for reducing ores, sands, and the like. T. W. Keet. British 365,725.

Machines for working marble. R. Croquet. British 365,905.

Continuous crusher, mixer and rubber for foundry sand. Alfred Baillot, St. Ouen, Seine, France. Canadian 319,749.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

Anti-Friction Locomotive Finishes Long Test Run

After operating on fourteen different railroads since it was put in service in April, 1930, the first locomotive ever to be equipped with anti-friction bearings recently pulled into the Seattle terminal of the Northern Pacific Railroad at the termination of the run which completed its initial test period of 100,000 miles.

The locomotive is equipped with Timken tapered roller bearings in all axles. During the test period it operated from coast to coast under every conceivable condition of climate, temperature, terrain, and trackage, hauling the heaviest freight trains and the fastest passenger trains. During the entire test period not a single instance of bearing trouble was recorded; nor was any train delay ever occasioned by bearing disability.

Manufacturers' Publications

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Batching Plants

The Butler Automatic Cement Weighing Batcher and Bulk Cement Handling Plant. 4 p. (Butler Bin Co., Waukesha, Wis.) Describes and illustrates an all-steel plant for unloading bulk cement from cars and proportioning batches automatically by weight. Portable bins are built in sizes of from 140- to 428-bbl. storage capacity.

Boilers

The VM Type Boiler. 8 p. (Combustion, Engineering Corp., New York, N. Y.) Describes and illustrates a boiler of the bent-tube type, especially adapted to plants having limited space conditions and particularly where the head-room is low. Available in sizes ranging from 1,215 sq.ft. to 5,328 sq.ft. of heating surface.

Chains

Rex Roller Chains and Sprockets. 112 p. (Cat. No. 440. Chain Belt Co., Milwaukee, Wis.) Describes and illustrates a complete line of chain and sprockets for the transmission of power. Contains some especially valuable tables for computations and complete specifications of each product listed. Preferred and incorrect arrangement of drives is illustrated by drawings. Horsepower and chain-velocity charts are included.

Drilling

The Thurston Detachable Bit and the Organization Behind It. 12 p. (Flannery Manufacturing Co., Pittsburgh, Pa.) Describes and illustrates a detachable bit and fittings for quarry drilling. Also traces the history of the organization and the development of the bit.

Dump Bodies

Wood Dump Bodies and Hoists for 1 and 1½ Ton Chassis. 12 p. (Bull. No. 7. Wood Hydraulic Hoist & Body Co., Detroit, Mich.) Describes and illustrates a complete line of dump bodies with hydraulic-hoist equipment for small trucks.

Heil Dump Unit for Ford Trucks. 8 p. (The Heil Co., Milwaukee, Wis.) Describes and illustrates a hydraulic dumping unit for mounting on Ford trucks. An all-welded steel body is featured.

Engines, Gasoline

Buda Power Units. 4 p. (Bull. No. 587. The Buda Co., Harvey, Ill.) Describes and illustrates a gasoline engine with pulley mounted on skids for a wide range of uses where dependable power is required. Comes in sizes from 25-33 hp. to 75-87 hp. in four-cylinder models.

Excavating Equipment

The Ground-Hog for January-February, 1932. (The Marion Steam Shovel Co., Marion, O.) A special convention edition of this popular industrial magazine produced especially for distribution at the annual meetings of the American Road Builders' Assn., National Sand & Gravel Assn. and National Crushed Stone Assn. Its 48 pages contain a number of worthwhile articles of interest to operators.

Explosives

Hercules Gelamites. 12 p. (Hercules Powder Co., Inc., Wilmington, Dela.) Tells the story of the development of an explosive designed to do the work of gelatines at a saving of 10 to 20 per cent. in cost.

Portable Equipment

Jeffrey Portable Equipment. 52 p. (Cat. No. 530. The Jeffrey Manufacturing Co., Columbus, O.) Describes and illustrates portable loaders, conveyors, elevators, screens, etc., for handling sand, gravel, crushed-stone and similar materials.

Western Crushing and Screening Equipment. 32 p. (Bull. W32A. Western Wheeled Scraper Co., Aurora, Ill.) Describes and illustrates the new and improved portable crushing and screening plants produced by this firm. The various units—crushers, screens, conveyors, elevators, etc.—are described in detail.

Pumps

Morris Type F Heavy-Duty Dredging Pumps. 4 p. (Bull. 146. Morris Machine Works, Baldwinsville, N. Y.) Describes and illustrates a line of dredging pumps designed especially for the economical pumping of highly-abrasive mixtures against high heads.

Screens, Vibrating

Lippman Vibrating Screens. 8 p. (Lippman Engineering Works, Milwaukee, Wis.) Describes and illustrates an efficient vibrating screen, worked by its simplicity and the thoroughness with which it sizes materials. Made in single-, double- and triple-deck models. Self-propelled loaders and steel bins made by the company are also shown.

Universal Vibrating Screens 32 p. (Cat. No. 99. Universal Vibrating Screen Co., Racine, Wis.) Describes and illustrates in detail the latest model vibrating screens made by this concern. Contains authentic testimonials from users and an informative chapter on installation methods.

Wire Rope

Twelve Reasons Why. 20 p. (Hazard Wire Rope Co., Wilkes-Barre, Pa.) Points out the salient features of Lay-Set, a preformed wire rope manufactured by this company. Graphic illustrations are used to amplify the text, which is brief and to the point.

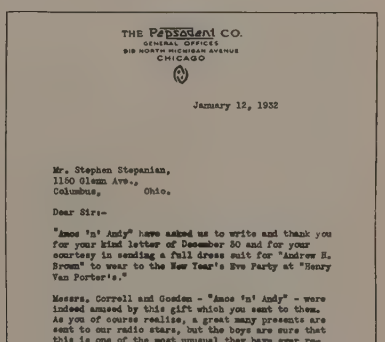
Court Denies Exclusive Use of Term "Dry Ice"

Exclusive use of the term "dry ice" for solid carbon dioxide when used as a refrigerant has been denied by the circuit court of appeals sitting at New Orleans, La. The court handed down its decision after hearing appeals and cross appeals in the suit brought by the Dry Ice Corp. *et al.* against the Louisiana Dry Ice Corp.

By the decree, it was determined that the term "dry ice" does not constitute a valid trade-mark for solid carbon dioxide since it has become synonymous with solid carbon dioxide in the public mind.

Book Review

THE FORD MODEL A CAR AND MODEL AA TRUCK. *By Victor W. Page. The Norman H. Henley Publishing Co., New York, N. Y. 703 pp. Price $2.50.* Construction, operation and repair of Ford trucks, cars and engines is contained in this enlarged and revised edition which includes, besides previously published matter, four new chapters dealing with all important changes up to and including 1931. There are 318 illustrations and a special chapter deals fully with the Model AA truck and its four-speed transmission, bevel drive, rear axle and all changes in chassis parts. Numerous suggestions for maintenance and repair have been added making the book of value to the operator who uses Ford trucks as well as locomotives powered with Ford engines.



THE Pepsodent CO.
GENERAL OFFICES
918 NORTH MICHIGAN AVENUE
CHICAGO

January 12, 1932

Mr. Stephen Stepanian,
1160 Glenn Ave.,
Columbus, Ohio.

Dear Sir:-

"Amos 'n' Andy" have asked us to write and thank you for your kind letter of December 30 and for your courtesy in sending a full dress suit for "Andrew H. Brown" to wear to the New Year's Eve Party at "Henry Van Porter's."

Messrs. Correll and Gosden - "Amos 'n' Andy" - were indeed amused by this gift which you sent to them. As you of course realize, a great many presents are sent to our radio stars, but the boys are sure that this is one of the most unusual they have ever received. They sincerely appreciate this evidence of your interest in their radio feature, and they hope that you will always find the same enjoyment in their programs that you have in the past.

With sincere best wishes, we are

Yours very truly,

THE PEPSODENT CO.

J. MacArthur,
Advertising Department.

GM:MW

Stephen Stepanian, president of the Arrow Sand & Gravel Co., Columbus, O., is an ardent "Amos 'n' Andy" fan. He received the above letter from the sponsors of the program after he had sent a full-dress suit for Andy to wear at the Van Porter's New Year's Eve party.

New Machinery and Supplies

Two New Roller-Bearing Jaw Crushers Introduced

The Austin-Western Road Machinery Co. announces two new Western roller-bearing jaw crushers for use either as separate units or in the new Western No. 100 and No. 90 portable crushing-and-screening plants. The Western No. 940 crusher has a jaw opening of 9 in. by 40 in., while the No. 440, which is generally used as a reduction crusher, has a jaw opening of 4 in. by 40 in.

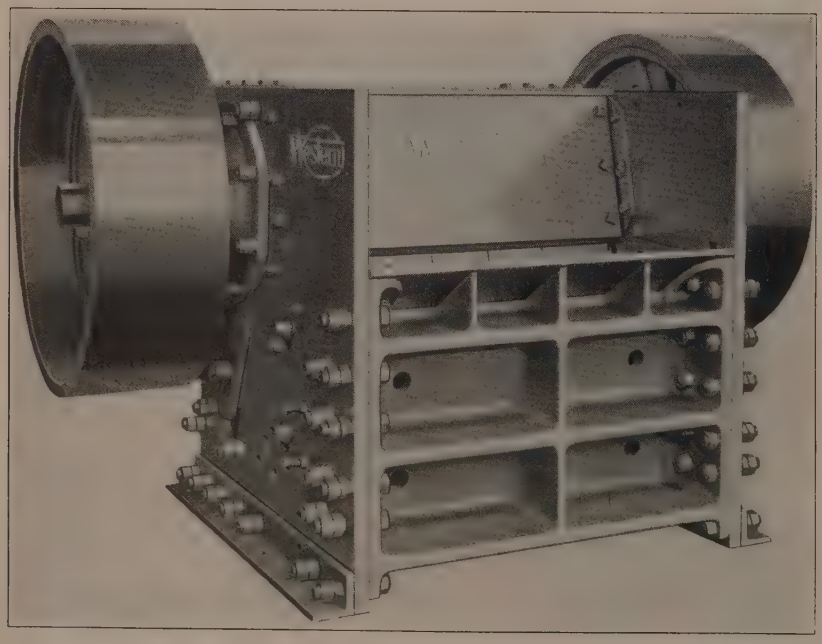
Both these crushers are of the overhead eccentric type, which has proved to be better adapted than any other for fine-reduction crushing. The greatest movement of the pitman in this type of crusher is at the top. There is comparatively little movement at the bottom, and it is therefore possible to produce large quantities of 1-in., or smaller, material, containing practically no over-size. The action of the eccentric also produces what is best described as a force feed, whereby the rock or gravel received by the jaws is crushed with a rolling, downward motion. The crushers have plate frames, which are both stronger and lighter than cast frames, and main shafts of chrome-nickel steel, forged and heat-treated.

It is not practicable to use shafts so large that they will be absolutely free from deflection under load. The only way to insure freedom from shaft and bearing trouble is therefore by the use of self-aligning bearings, which permit the shaft to spring in any direction. Western shafts turn in SKF self-aligning roller bearings, which have an unequalled reputation for performance and all-around operating efficiency.

The pitman is a steel casting. Its upper end is bored to provide an accurate fit for the shaft bearings, while the lower end has a groove planed to receive the manganese-steel toggle seat. The front face, which supports the moving die, is also planed.

The toggle is a high-carbon steel plate, which is about 50 per cent. lighter than cast iron, and is of uniform strength. Stationary and moving dies are of manganese steel, and reversible, while the cheek plates are made in sections to reduce replacement expense.

A special catalog describing these and other Western crushers, together with the complete line of Western crushing and screening plants, may be had upon application to any office of The Austin-Western Road Machinery Co., or its home office in Chicago.

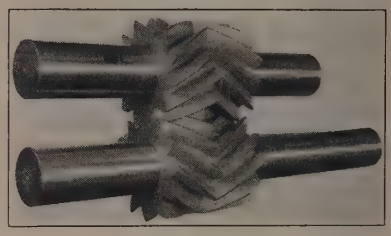


The 9-in. by 40-in. jaw crusher.

Herringbone Gears Used as Impellers for Pumps

Farrel-Sykes herringbone gears have a world-wide reputation for use in the transmission of power. They have, however, other applications which are not so well known.

The illustration shows a pair of pinions used as impellers, sometimes called cams and rotors, for the gear type of pump. Farrel-Sykes gears are being widely used for this purpose.



Pair of pinions used as pump rotors.

Many of the best known pump makers use them as standard. They are said to have numerous advantages for this purpose. Pumps made with these gears are more efficient mechanically and volumetrically. They can run at a very high speed. The smaller size pumps are used with motors direct connected to them, running up to 1800 r.p.m. Such pumps are often used for high pressures; 1,000 lb. per sq. in. is standard with some makers using Farrel-Sykes gears and in some special cases the gears are used for pressures up to 1,500 lb. per sq. in.

The application of Farrel-Sykes gears to large capacity pumps has recently become general. The gears shown in the illustration run at 435 r.p.m. and pump 625 gal. per min. against a head of 200 lb. A pump of this kind makes a simple and efficient installation. It is very small for its capacity, no reduction gears are required, and it is consequently economical to manufacture.

The pump rotors are made in a variety of material, including bronze, high-carbon forged steel, nickel-alloy cast iron, and various alloy steels including Nitralloy. The gears made in this last named material are of great advantage. They are exceedingly accurate and have no backlash or bottom clearance. The shape of the tooth is designed to reduce trapping of the liquid to a minimum, and to eliminate hydraulic noises.

Experience Reflected in Ford Locomotive Design

The culmination of 14 years' experience in building industrial locomotives with Ford power is reflected in the design and construction of the series of BFA models manufactured by the Brookville Locomotive Co. of Brookville, Pa. In reviewing the accomplishments of this pioneer locomotive maker in the annual review number of PIT AND QUARRY, the reference to these locomotives created the impression that Brookville had only recently entered this field. On the contrary, this company's engineers have studied the application of the Ford engine as a locomotive power unit since 1917, when its first model, driven

by the old reliable Ford Model T engine, was introduced. Since that time, these locomotives have undergone constant improvement and, with the introduction of the Ford "AA" motor four years ago, they have developed still higher efficiency.

The present models have four speeds forward and four in reverse, with track speeds ranging from 3 to 16 mi. per hr., supplying a suitable speed for varying load and track conditions. Dual-spring wheel suspension combined with wide wheel faces and a short whellbase permit use even over poor track. The Ford engine, equipped with governor control, develops 40 hp. at 2,200 r.p.m. Journal boxes are equipped with either Brookville bronze or Timken roller bearings. Standard auxiliary equipment includes electric starter, governor, signal gong, carburetor air cleaner, 4-wheel brakes and sanders for both forward and reverse work. A fully-inclosed, clear-vision cab is optional, as are the headlights.

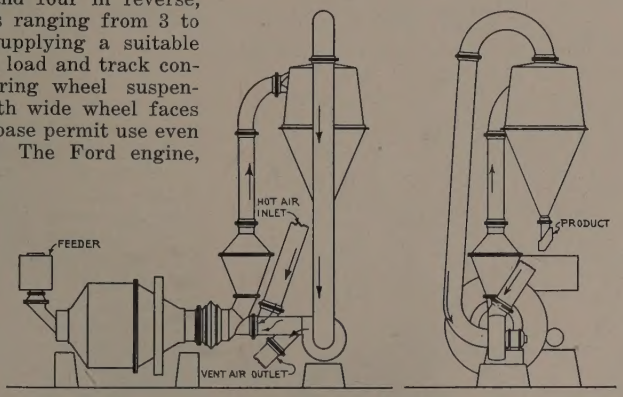
A distinct advantage of the Brookville BFA Ford-powered models is the ease with which service may be obtained when required. Ford-trained mechanics may be found in service stations in every city or hamlet, thus assuring expert attention when repairs or adjustment become necessary. This applies not only to the engine but to the clutch and transmission as well, these standard Ford units being incorporated in the locomotives.

Drying Method Improved in Conical-Mill System

Further developments have recently been made in the system of drying while pulverizing in the Hardinge conical ball-mill. The accompanying illustration shows the arrangement of the mill for air drying.

It will be noticed that the hot-air inlet is in the pipe used by the blower for forcing the oversize return from the air classifier back into the mill. The vent air outlet is ahead of the hot-air inlet, and discharges the moisture-laden air that has passed through the system.

The outlet is so arranged that the required amount of air is withdrawn adjacent to the blower outlet. This creates a partial vacuum in the mill, which draws the hot air in directly at the point where the oversize is being returned from the classifier. The oversize is thus heated as it passes through the current of hot air on its way back to the mill, where it mixes with the moisture-laden incoming feed. This method of heating the oversize before it mixes with the damp feed prevents any tendency to pack, as well as eccelerates drying within the mill itself. The hot air entering the mill absorbs and carries off the moisture liberated from the material. This "two-way" action is said to materially increase the grinding efficiency of the system.

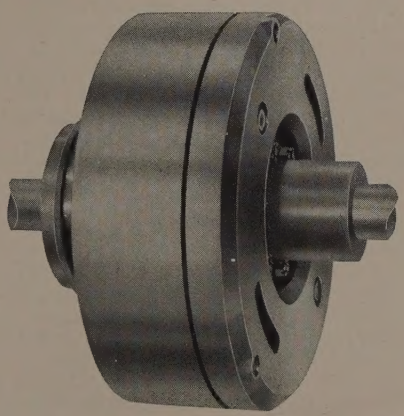


Arrangement of the conical ball-mill for air drying of pulverized material.

Magnetic Friction-Type Clutch Simple in Design

To meet the ever-increasing demand for powerful magnetic friction-type clutches of smaller physical dimensions, the Dings Magnetic Separator Co. of Milwaukee offers a new clutch of this type.

This is a simple magnetic friction clutch having contact faces on both sides of a spring disk which are "squeezed" between the magnet and armature elements when the coil is



Compact magnetic friction clutch.

energized. Theoretically the power transmission of this clutch is double that of a single friction contact face but actually it is of approximately 75 per cent. greater torque with same magnet strength. Within certain physical limits having 175 per cent. torque of a single contact face is of material advantage.

All provisions are made for adjustment to compensate for wear of contact faces. Light springs on the armature holding bolts serve to expel the armature when coil is de-energized, thus assuring ample clearance.

The clutch is made with or without ball bearings between the hubs of the two clutch members, as installation conditions might require, to insure proper alignment.

The Dings company has also developed a single-spring disk clutch following the same general construction as the above described unit but having three friction contact faces with the consequent increased torque and power transmission. In it clearances are positively provided and simplicity commends.

It is the practice of the Dings company to provide always a housing over the slip-ring brush holder assembly for complete protection. The friction wearing faces are a hard and tough asbestos compound formed to fit the clutch disk to which they are securely riveted. Coils are form-wound, vacuum-pressure impregnated and securely held in the magnet element from which they are amply insulated.

The clutch is without projections and all dowel-pin holding bolts have lock nuts.

The common clutch installation is to mount the magnet element on the driving shaft and disk element, on which only friction contact surfaces are mounted, as the driven member. However, it is perfectly feasible to reverse the clutch mounting.

Detachable-Tip Welding Heads Speed Production

A new series of welding heads with detachable tips has been introduced by The Linde Air Products Co., New York, N. Y., for use with the Oxweld Type W-17 welding blowpipe. These will supplement the one-piece style heads for this blowpipe, so that the user will have a choice of two types of welding heads.

The new detachable tip heads were developed particularly for pipe line welding and for production operations. The new tip produces the same type of flame as that produced by the one-piece welding head for the Type W-17 Blowpipe. Sizes No. 6 to No. 13, inclusive, are available in the new welding heads.

One of the practical features of the new design is the satisfactory connection between the tip and the stem provided by the male thread on the tip which screws into the stem. Removal or replacement of the welding tip is thus greatly facilitated.

Hydraulic Control Used on New Type Bulldozer

A new type of bulldozer containing many features not hitherto combined into one unit has been introduced by the LaPlant-Choate Manufacturing Co. of Cedar Rapids, Ia. The new machine, known as the Hylift, features a double-acting jack, which permits using the hydraulic power to force the blade down as well as to raise it. With this new jack and special yoke attachment

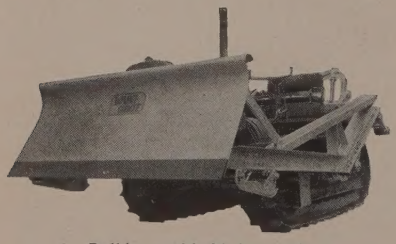
the blade may be raised 33 in. above the ground or lowered to 18 in. below the track level.

The double-acting jack, with its ability to force down on the blade, makes the Hylift Bulldozer particularly useful for skimming off top soil, for assisting in digging and spreading gravel and is of particular value for applying pressure to the blade when backing up to obtain a more even spread on previously leveled material.

The bulldozer can be operated with ease and sureness because of the absolute hydraulic control. The power for this hydraulic control is obtained from a single rotary gear pump attached to the tractor power-takeoff. This pump runs constantly in oil, thus minimizing any chance of wear.

The control valve is bolted directly to the pump, and contains the oil bypass for use when the jack has reached its full extremity on the raise and lower position. By the introduction of a thrust ball-bearing between the valve body and the spring which holds the valve in its seat, the sliding friction, which was prevalent in the old valves without this bearing, is replaced by a rolling motion which reduces the friction and assures easy turning under pressure. An adjusting screw is provided to regulate the tension.

Positive leverage is obtained by means of lever arm linkage which transmits the power from the jack to the main frame. The blade on the Hylift Bulldozer is made of a one-piece, heavy rolled-steel plate, bent over at the top to form a channel, and heavily reinforced by eleven angle-iron ribs hot-riveted to the back of it.



Bulldozer with blade raised.

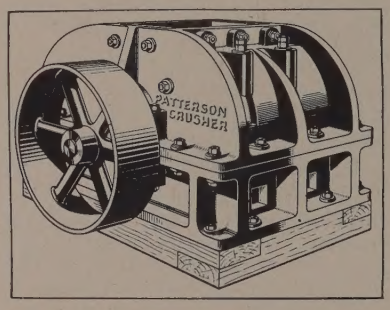
A heavy bent plate at the bottom of the blade reinforces the cutting edge. Riveted to this plate, both on top and bottom, are cast steel-reinforcing brackets. The cast reinforcement on the top of this plate holds the strut arms which brace the blade against the main frame cross beam, forming a perfect bridge truss girder construction.

A 10-in. cast-steel shoe, with a removable crucible-steel sole, is fastened to each side main-frame member. This show can be quickly adjusted, both front and rear, to permit cutting at any level desired. This adjustment of the shoe also compensates for wear on the cutting edge. The entire shoe can be lifted and fastened in the clear for bulldozing work in rock and similar material where shoes are not desirable.

Eccentric Action Basic Feature of New Crusher

The Patterson Foundry & Machine Co. of East Liverpool, O., has developed a high-efficiency crusher known as the Patterson Gyro-centric, noted for its speed, high capacity, durability and economy of operation.

The Gyro-centric has but a single moving part—a manganese roll which by rapid gyro-eccentric motion operates against two concave manganese crushing plates. By its short rapid strokes, the Gyro-centric is highly effective in operation. No needless energy is exhausted. The entire crushing chamber is utilized since crushing action takes place almost immediately upon feeding rock into the hopper. From that point gradual reduction takes place surely and rapidly until

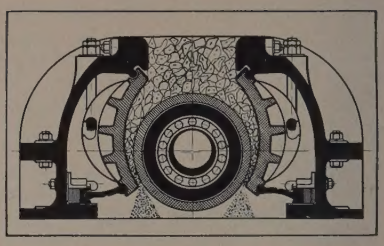


The gyro-centric crusher.

material reaches the desired size. The Gyro-centric actually crushes, no rubbing action takes place whatever, and friction is absolutely minimized.

Essentially the crusher consists of but three major parts, the case (or frame), the concave crusher plates and the cylindrical crusher roll. The roll which is the only moving part of the entire assembly has a manganese-steel shell which does not revolve with the shaft but creeps slowly so that wear is evenly distributed over its entire circumference. The revolving eccentric shaft imparts a gyro-eccentric motion to this roll. The material flows down and is crushed on both sides of the roll, thus tremendous capacity results. The true compressive action insures a minimum of fines in production. The simple construction made possible by this unique design likewise reduces maintenance.

Practically all parts, including the frame, are of steel. The shaft, the backbone of any crushing unit, is a chrome-nickel steel forging of huge proportions and is mounted in large double Timken taper roller-bearings of great radial and thrust capacity as well. The manganese-roll cylinder is supported by special heavy-duty American straight roller-bearings with inner and outer races of precision-ground special alloy steel. Side thrust on the cylinder is taken at the center by bronze thrust bushings and transmitted to the shaft and absorbed by the Timken bearings.



Cross-section of the crusher showing how the single roll effects reduction of material.

The entire assembly is self-contained and lubricated with light grease by means of a single Alemite fitting, so that any tendency of grit or dirt to enter is resisted by the lubricant itself which fills all available space and, by expansion, forces the dirt and grit outward. Main bearings, too, are lubricated by the Alemite grease system. Thus, the entire machine is lubricated at but three points, making gears, pumps and similar delicate parts (requiring costly maintenance on many crushers) quite unnecessary.

The manganese crusher plates have a special concave curvature and contribute, to a great extent, to the ability of the Gyro-centric to produce far greater tonnage in comparison with other crushers. Crusher plates are reversible in order to compensate for continual wear.

Safety breaker plates guard against serious damage when tramp iron or other foreign matter lodge in crushing chamber. All parts are easily removed. For all ordinary work the machines are furnished with a smooth roll and crushing plates. Corrugated roll and crusher plates can be furnished for handling "slabby" materials.

The Gyro-centric may be operated with either right- or left-hand rotation and requires but minimum head room and small floor space.

Sulphur Deposit Found in Pennsylvania Quarry

R. R. Rosenkrans, an instructor in mineralogy at Pennsylvania State College, recently discovered native sulphur in Centre county, Pennsylvania, according to Dr. A. P. Honess, professor of mineralogy.

Mr. Rosenkrans at the time of the discovery was searching for bentonite for a correlation study which he is making of the volcanic deposits of central Pennsylvania. He was examining an old quarry situated about 8 miles north of State College, Pa., when he noticed the unusual occurrence of sulphur in the locality. All tests proved the substance existing in the limestone to be native sulphur.

A foreign license has been granted to the Amtorg Trading Corp., a New York concern, to do a general merchandise business in Illinois with headquarters at 30 West Washington St., Chicago. The Illinois agent is C. Korneff.

Saving Through Safety

*Practical Safety Methods Applied to the Sand-and-Gravel Industry**

By H. W. HEINRICH
The Travelers' Insurance Co.

THE experience of insurance companies that extend compensation coverage to sand-and-gravel operators provides a fair measure of existing accident cost. In building up the insurance rate a certain percentage is allowed for direct losses in the form of compensation and medical payments. It is generally agreed, however, that these constitute but one-fifth of the total accident cost. The remainder is made up of the expense resulting from the lost time of employees who are not injured, decreased production, delays, spoilage of work, damage to property, training new employees, loss of good-will, upset *morale*, and other incidentals. The following table shows the direct, the indirect, and the total accident costs.

ACCIDENT COSTS IN THE SAND-AND-GRAVEL INDUSTRY

Total annual income	$115,176,543
Annual pay-roll	33,526,228
Average compensation rate per $100 of pay-roll	5
Compensation premium	1,676,311
Direct losses	1,005,786
Indirect losses	4,023,144
Total losses	5,028,930
Total accident cost in per cent. of pay-roll	15
Total accident cost in per cent. of income	4.3

An individual sand-and-gravel operator, who desires to know his approximate total annual accident cost, may estimate it as 300 per cent. of his compensation-insurance premium for one year. If he is paying $5,000 annually, for example, his accident cost, including both direct and indirect losses, is $15,000. Of this sum at least half may be saved, in the average case.

Although these costs or losses vary according to different localities and conditions, the foregoing estimates are fairly accurate and assuredly constitute a good reason for doing something about accident prevention.

Notwithstanding the splendid safety work done by the service engineers of insurance companies, federal and state labor departments, and safety councils, the results attained in attempting to control accident frequency and cost necessarily depend largely on the interest and the action of employers. Guarding of machinery, the removal or mitigation of mechanical hazards, and the enforcement of safe practice primarily are functions of internal business management. They are so accepted and practiced. The methods used, however, are not always as effective as they should be or as they could be.

A striking similarity exists in the causes and procedure for accident occurrence and for the control of the quality and the volume of production. If it is granted, therefore, that suitable executive procedure is already in existence to control faulty product, it must likewise be clear that this same executive machinery need only be extended to include accident occurrence, in order to attain results in accident prevention. As a first principle of practical safety work, it must be admitted that executives should lend their interest and support and should enter actively into the direction and supervision of accident-prevention work.

The busy executive, who is convinced that he should take action to control accident frequency, is often puzzled as to what particular course to adopt. Accident prevention is portrayed as a complex general educational system necessitating detailed record-keeping, meetings and talks, safety literature, and other work that involves a great deal of so-called "red tape." The picture is inaccurate. Meetings and talks and general educational work have value, of course. Record-keeping likewise is important. In varying degree these things are essential in all safety work. They do not, however, constitute the vital elements of accident prevention, and may often be omitted without sacrifice of safety, provided the things of first importance receive attention.

Executives should bear in mind that industrial problems are best solved when action is based on pertinent facts. This is as true of accident prevention as it is of other problems. Since everything can not be done at once, there should be concentration on facts of major interest. In accident prevention these facts relate to the unsafe practices of workmen, and the causes for these practices, and to mechanical hazards. The claim records of the Travelers' Insurance Co. provide the essential facts for the sand-and-gravel industry as a whole. The following ten unsafe practices and ten unsafe mechanical conditions have been selected as outstanding items:

Unsafe Practices—

1. Crossing and walking on railroad tracks without exercising proper precautions.
2. Riding on the front ends of locomotives.
3. Climbing over and going under cars.
4. The failure to use life lines and to have helpers stand by, when entering sand hoppers and bins.
5. The failure to wear goggles when breaking stone.
6. Employees working too close to the bucket of a power shovel.
7. The guards are removed from mechanical equipment.
8. Pinch-bars, air-hose, and other objects and materials are left in working spaces.
9. Workmen operate car brakes without standing with one leg inside the car.
10. Railroad ties are stacked too high and are piled insecurely.

(Note: These dangerous practices are followed primarily because rules for safe conduct are not rigidly enforced.)

Unsafe Mechanical Conditions—

1. Portable and stationary electric-power equipment is not properly grounded.
2. Switches and other current-carrying parts are not isolated or protected.
3. Electric light and power wires are not elevated sufficiently.
4. Handrails on elevated runways, platforms, and stairs are not provided or, if installed, are not kept in good repair.
5. Through-line railroad tracks are not fenced off.
6. Safe cross-over arrangements are not made for through-line railroad tracks.
7. The practice of using rods to bring down vertical or overhanging sections of gravel banks is unsafe. Until the industry agrees upon a safer standard practice, this remains an inherent mechanical hazard.
8. Safe clearances are not allowed between cars and locomotives and side and overhead work.
9. Power cables to portable electric-shovels and other electric equipment are not strung overhead.
10. Artificial illumination of dangerous places is inadequate.

Knowledge of major accident facts for the entire industry is valuable as a guide, but the individual employer should know the facts for his own particular operations. Mechanical hazards cause many accidents, and common sense dictates that they should be found and corrected. This part of safety work is relatively easy. More important in the effect on accident frequency are the unsafe practices of workmen, which lie at the base of the so-called "man-failure" accidents and account for the great majority of all accidents. It is necessary that the practices be determined by careful analysis of past experience and present conditions, and also that the reasons for the existence of these practices be discovered. One set of facts

* Presented at the 16th annual convention, National Sand and Gravel Assn., Pittsburgh, Pa.

is the complement of the other. The practices show **what** is correct, and the reasons or causes show **how** to do the job of correction. Here the services of a competent engineer-analyst are invaluable.

A typical example of accident analysis in an individual sand-and-gravel operation follows:

UNSAFE PRACTICES	CAUSES
1. Men engaged in barring down banks face away from the banks when slides occur.	Not instructed.
2. Men sit on the rear platform of a power-shovel.	Disregard of instruction.
3. Men cross main railroad tracks at other than designated places.	Disregard of instruction.
4. Men enter bins and hoppers without using life lines and without having helpers at hand.	Disregard of instruction.

UNSAFE MECHANICAL CONDITIONS	CAUSES
1. Air-hose, electric cable, tools, and equipment left lying in working spaces.	Poor housekeeping.
2. Stair treads defective and risers not of uniform height.	Poor construction.

These particular practices and conditions had been responsible for the occurrence of 76 per cent. of all the accidents during a period of two years. Concentration on the correction of them resulted in a reduction of accident frequency and cost of over 60 per cent. in one year. This record could not have been achieved, however, if the remedy applied had consisted merely of a general safeguarding and educational program. In such a case the efforts would have been scattered over too large an area and consequently would have been weak and ineffective. Excessive expense and lack of results would have caused irritation, dissatisfaction, and the ultimate abandonment of safety work. The lack of knowledge of causes for unsafe practices would have prevented the choice of a suitable method of correcting the practices.

There is no particular difficulty in controlling accident experience when the executives are interested, when the essential facts are known, and when suitable action is taken.

Suitable executive machinery now exists in every well-conducted sand-and-gravel operation to take care of accident prevention without changes, additions, or excessive cost. This is true because the causes of accidents and the methods for accident prevention are exactly the same as the causes and methods relating to the control of the quality and the volume of production. Trained business executives well know how to deal with employees who disregard instructions and consequently spoil materials or delay production. No particular trouble is experienced in getting men to report for work at a given time or place. There is no difficulty in enforcing the hundreds of rules that are necessary for the economic and profitable functioning of an industrial enterprise. There is no difference between the control of such things and the control of accidents, except attitude.

Employers have a right to expect that wage-earning employees will obey the rules that have been laid down for them. They have a right to expect that supervisors or foremen will see that the workers follow the rules, because these supervisors are paid to do exactly that. (These assertions clearly apply to all rules, whether they relate to production or to safety.)

It is only necessary, therefore, for the executives to take a personal and active interest in safety, to determine by analysis exactly what is wrong and why it is wrong, and then apply the needed pressure to get results.

No one will disagree with the statement that it is easy to cure a given trouble provided: (1) that the cause of the trouble is definitely known, (2) that the cause can practicably and effectively be attacked, (3) that the will to attack it exists, and (4) that the proper action is initiated and followed up.

All that has been said is intended to place special emphasis on the importance of determining pertinent accident facts. In reality this is the key to the industrial-accident problem of to-day. The tremendous total of direct and hidden costs of accidents, coupled with normal humanitarian motives, has aroused interest in employers. They are willing to assist in improving conditions but in most cases the action taken is not predicated on accident facts. The purpose of these remarks is to describe these facts and the method of acting on them. Common-sense accident prevention of the kind here discussed is becoming more general. Progress is being made. Still more widespread acceptance of the principles will speedily solve the safety problem. It would be encouraging to see sand-and-gravel operators take a leading part in a work of such great benefit to the industrial world.

Los Angeles Aggregates Firm Reports Profits Up

(Continued from page 76)

sets increased from $319,556 at December 31, 1930, to $569,277 at the close of 1931, an increase of 78 per cent. During the year the per cent. of cash to all current assets increased from not quite 19 per cent. to slightly over 40 per cent. and the per cent. to all current liabilities from 27 per cent. to 133 per cent. The ratio of current assets to current liabilities increased from 1.45 to 3.31 or 128 per cent.

Bank loans of $100,000 were liquidated during 1931. Purchase contract obligations of $253,090 as of December 31, 1930, were reduced by $203,579 or to the relatively small amount of $49,511. The reduction of current liabilities was more than twice the reduction in current assets. Funded debt was reduced $463,000.

During the year the company increased its current assets and decreased its current liabilities and funded debt, a total of $750,149.37.

Cleveland Quarries Co. Declares $.25 Dividend

Directors of Cleveland Quarries Co. at their regular meeting held January 29 at Cleveland, O., declared a quarterly dividend of 25 c. per share on the common stock of the company, payable March 1 to stock of record February 15. The dividend is the same as paid in the previous quarter. During the meeting, directors expressed the hope that the company might soon be able to resume payments to stockholders on a larger basis. The company paid a total of $3.50 per share in the preceding fiscal year and possibilities for an increase over the present rate will, of course, depend on an upward trend in earnings.

Cleveland Quarries Co. is one of the more important producers of silica sand and sandstone in the lower Great Lakes region. It operates four quarries and processing units located at Grindstone City, Mich., Amherst, O., Berea, O., and Birmingham, O. H. W. Caldwell is president.

International Salt Co. Reduces Dividend Rate

International Salt Co. has declared a quarterly dividend of 50 c., payable April 1 to stock of record March 15, placing the stock on a $2 annual basis against $3 previously.

Edward L. Fuller, president, stated that the dividend reduction was due to the more or less unsettled conditions of general business, as well as to conserve the cash position of the company. Mr. Fuller stated that while sales of the company so far this year have been somewhat disappointing, the first quarter is usually the poorest of the year for the company. It is likely that the usual seasonal increase will be shown beginning in March or April. If later in the year business should improve to the extent of warranting a restoration of the dividend to the former rate of 75 cents quarterly, it will be given serious consideration by the board of directors, he said.

Forms Separate Company to Handle Sale of Bins

The bin division of the Beaumont Manufacturing Co., Philadelphia, has recently reorganized and will be known in the future as the Beaumont Bin Co. The company will devote itself entirely to specializing in the design and manufacture of all types of bins including storage and aggregate bins, central-mixing plants, bulk-cement handling, automatic weigh-batchers and all types of bin gates. The company's main office is at 319 Arch St. with branches at New York, Chicago, Cleveland and Detroit.

A new bulletin showing the equipment offered is ready for distribution.